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UNITED STATES  
EXPLORING EXPEDITION.

DURING THE YEARS

1838, 1839, 1840, 1841, 1842.

UNDER THE COMMAND OF

CHARLES WILKES, U. S. N.

VOL. XIII.



C R U S T A C E A.

BY

JAMES D. DANA, A.M.,

MEMBER OF THE SOC. CÆS. NAT. CUR. OF MOSCOW; THE SOC. PHILOMATHIQUE OF PARIS; THE  
GEOLOGICAL SOCIETY OF LONDON; THE AMERICAN ACADEMY OF ARTS AND SCIENCES  
AT BOSTON; THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, ETC.

WITH A FOLIO ATLAS OF NINETY-SIX PLATES.

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PART I.

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PHILADELPHIA:

PRINTED BY C. SHERMAN.

1852.



Q115  
M45  
V.13

UNITED STATES

EXPLORING EXPEDITION

OF THE YEAR

1845-1846

UNDER THE

COMMANDEMENT OF

WILLIAM

CURTIS

BY

JAMES M. SMITH

DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, WASHINGTON, D.C.

WITH A FORD'S MAP OF THE GREAT PLAINS

PART I

PHILADELPHIA

PRINTED BY G. B. KEENE

1846



CRUSTACEA.

PART I.









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## CRUSTACEA.

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### INTRODUCTORY REMARKS.

THE collections of Crustacea, which are the subject of the following Report, were made by the Exploring Expedition at all the various points visited in the course of the cruise, and through all the oceans traversed. The principal coasts which have contributed to the department are as follows:

- |                                   |  |
|-----------------------------------|--|
| 1. Madeira,                       | 12. Society Islands,                     |
| 2. Cape Verde,                    | 13. Samoan or Navigator Islands,         |
| 3. Rio Janeiro,                   | 14. Tongatabu,                           |
| 4. Rio Negro, Northern Patagonia, | 15. Feejee Islands,                      |
| 5. Nassau Bay, Tierra del Fuego,  | 16. New Zealand,                         |
| 6. Valparaiso, Chili,             | 17. New South Wales,                     |
| 7. Callao, Peru,                  | 18. Kingsmill Islands,                   |
| 8. San Francisco, California,     | 19. Wakes Island,                        |
| 9. Coast of Oregon,               | 20. The Phillippines, Sooloo Sea, Singa- |
| 10. Sandwich Islands,             | pore, and Cape Town.                     |
| 11. Paumotu Islands, Pacific,     |  |

Our stay at these different places varied from twenty-four hours to four months; and the extent of the collections they afforded is consequently as various as the time allowed for exploration. The waters of the Atlantic, Pacific, Antarctic, and Indian Oceans also added largely to the number of oceanic species.

The scientific world naturally demands results correspondent with the opportunities for investigation. As bearing on this point, the



author deems it incumbent to state that the Crustacea constituted one out of three extensive departments under his charge, Geology and Zoophytes,—reports on which subjects are already published,—having occupied a large share of his time and labours. Moreover, the unfortunate wreck of the Peacock on the Columbia bar sacrificed all the collections made through two seasons in the South Pacific, ranging over the ocean from the Paumotus to the Navigator Islands and also to the Kingsmill Group, and only a few dried Crustacea, not included in the packages lost, answer to a detailed catalogue numbering more than a thousand specimens.

Besides this misfortune, another befell the collections after reaching the country, before the return of the Expedition. A large part of the packages were unfortunately opened, and the specimens prepared, by drying, for exhibition. By this means, the references to the catalogues were to some extent lost, and many specimens were badly injured. Some were rendered wholly unfit for description, especially those of small size, which, without regard to their delicacy of structure, were taken from the bottles containing them and dried, and sometimes transfixed with pins, to the obliteration of many of their characters. Moreover, the larger species were rendered by this process unfit for dissection.

Notwithstanding these occurrences, the number of new species described in the following pages exceeds five hundred, although in many of those collected we have been anticipated by foreign investigators, owing to the delay in our publications.

The species embraced belong to every branch of the department of Crustacea, including the minute Entomostraca as well as the higher grades. The subject of classification has therefore come necessarily under consideration. We have also been led for the same reason to a study of the homologies of Crustacea, and have endeavoured to present the parallel relations of species in all the prominent groups.



## I. ON THE CLASSIFICATION OF CRUSTACEA.

---

THE following observations on the classification of Crustacea relate only to the grander divisions of this class of animals. The various subdivisions and their distinctions come under consideration in the succeeding descriptive part of the work, in connexion with the detailed descriptions of the several groups.

In presenting our remarks on this subject, we offer first a few observations on the limits of the department of Crustacea, and a brief review of the distinctive characters of the class.

### I. LIMITS OF THE DEPARTMENT OF CRUSTACEA, AND DISTINCTIVE CHARACTERS OF THE CLASS.

1. *Limits.*—The only point of doubt that has existed of late upon the limits of the department of Crustacea refers to the lower orders of the class, and, through recent investigations, the uncertainties are now mostly removed. The Cirripedia have been claimed by the conchologist as Mollusca, and the Rotifers by Ehrenberg and others as a branch of Infusoria. The former are so completely like Cypridinea in the young state, as first shown by Thompson,\* both in external form and internal structure, and so unlike any species of Mollusca, that their relations to the Articulata were made out satisfactorily by this observation alone. The author collected some of these young *Anatifæ* in the Equatorial Atlantic in 1838, and, not being aware at the time of Thompson's investigations, the species were referred to the Cypris group. Subsequent investigations off Fuegia, where the young and adult forms were found together, enabled him to trace out the transitions. Another fact of importance, fixing the relations of the Cirripeds, was observed by the author in the harbour of Rio Janeiro. Numerous exuvia of Cirripeds were collected, proving that these animals undergo exuviation,—a process in growth characteristic

\* Zoological Researches, by J. V. Thompson, Esq., F.L.S., No. 3, January, 1830.



of this branch of the Articulata, and not so of any true Mollusca. Again, the organs of the mouth as well as the jointed structure of the legs are completely Crustacean in type.

The Rotifers have the mandibles and other mouth-organs of Crustacea, and some of them resemble certain Entomostraca in general form, and in the jointed structure of the caudal extremity. In these species we have, therefore, the lowest Crustacean form under a Radiate type,—the type of the inferior branch of the animal kingdom.

Crustacea also pass, by almost imperceptible shades, into Vermes, through the Caligus and Lernæa tribes; the most degraded Lernæan forms having the sluggishness and almost memberless character of the lowest worms. Their resemblance to the typical Crustacea is so slight, that, without a knowledge of the gradations through the well-modelled Caligi to the higher forms, their relations to the class would hardly be suspected.

2. *Characteristics.*—On account of the wide variations among Crustacea, the systematist experiences great difficulty in laying down the characteristics of the class.

The *higher* divisions have a regular heart; the *lower* (and this is true even of some Caligidæ) have no heart, and only two or three valves in the course of the circulation.

The *higher* have a system of vessels for the arterial circulation, the venous system only being lacunal; the *lower* have no vessels for circulation in any part, and the blood sweeps along among the muscles in broad currents, flowing off in side channels wherever passages are open, more like the sap in the leaf of a plant than what is naturally looked for in the zöological kingdom.

The *higher* orders have branchiæ for the aeration of the blood attached to the thoracic members; species of *another type* have allied organs attached to the abdominal members; and those of the *lower* orders are without any trace of branchiæ or corresponding organs, and the function of aeration devolves upon the exterior surface of the body.

The *higher* orders have a nervous ganglion for each segment of the body, and these ganglia are clustered in two masses only when the limbs are gathered closely about a centre, with the abdomen small and inflexed against the thorax, as in Crabs; but in the *lower* orders, although the body may consist of a series of segments, we find at times only one single ganglion, pierced by the oesophagus, and placed



above the mouth, from which cords pass forward and backward, and subdivide, in order to supply the posterior segments and their members; and in this particular, the great characteristic which is laid down as dividing the Articulata from the Mollusca, fails of being distinctive, and we find essentially the nervous system of a molluscan with a crustacean structure.

The *higher* have large biliary glands; the *lower* often no distinct glandular masses of this kind.

Again, as already observed, while in the *higher* orders the species have a series of limbs for locomotion and prehension, the members are reduced in the *lowest* to a single pair, or even this is wanting,—a long head with its mouth fitted for suction, and a long tail, making up the body.

What is, then, a Crustacean? No definition can be wholly satisfactory. As in other cases, the question must be answered by defining the essential characters of the typical form, and then the relations of the extreme divisions are to be distinguished by gradations of structure, rather than by complete conformity to the type. We observe, however, that there are some invariable characters. All have a straight intestine, without convolutions; all pass through a series of metamorphoses in development; all undergo exuviation; all have the head and thorax combined essentially in a single cephalothorax; all are aquatic in their mode of respiration, the surface of certain gill-like organs, or of some or all parts of the body, serving in aeration.

While, therefore, Crustacea, in their typical forms, have the nervous system of other Articulata, and are thus widely removed from Mollusca, they graduate into species that have nearly the nervous system of the latter division. Yet the articulated body, the structure of the mouth, the jointed appendages, the character of the intestine, and the process of exuviation, are decisive characteristics, with few exceptions; and in the exceptions, the species are elongated and resemble worms rather than Mollusca.

Again, while related to Insects in the nervous system, they are separated from them by the existence of branchiæ, or, if branchiæ are absent, by the fact that the surface of the body performs the function of aeration. In other words, while Crustacea are aquatic Articulata, Insects are essentially sub-aerial species. Moreover, the process of exuviation, the structure of the heart, the coalescence of the head and thorax, and the large number of jointed limbs in the typical forms,



besides other characters, distinguish Crustacea from Insecta. A close approximation of Crustacea to other Articulata is not to be expected, except with aquatic species. And we find an analogy with the aquatic larvæ of many insects, and still closer with certain Vermes, as the Helminths, into which the lower grades, as they are more and more nude of members, evidently pass. A strongly-drawn line is here not to be expected, since both are divisions of the same subkingdom, and both are fitted for the same element and similar modes of life.

The position of Crustacea in the scale of animals among the Articulata has been learnedly discussed by Professor Agassiz;\* and he has shown, we think satisfactorily, that they should rank below Insects, and above Worms. The gradation into Worms is evidence on the latter point, and the analogy to the aquatic larvæ of Insects on the former. This author remarks upon the greater number of limbs in Crustacea, which is also a peculiarity commonly of the *imperfect* insect or larvæ,—the smaller number in the mature insect being a result of a higher stage of development. He also observes that the separation of the head and thorax is further indication that Insects rank highest. It is true that Crustacea attain a size never found among the Insecta. But this is attributable to their living in a denser element, and is analogous to the occurrence of the largest but lowest of Mammalia in the ocean. Moreover, size of body is no necessary criterion of relative rank, for, unless the nervous system is of a higher grade as the size increases, the bulk is so far only an encumbrance to the weak forces within, and less agility of motion and inferior attributes in other respects are the consequence. Thus the huge medusa is but an unwieldy mass compared with minute acalephs, and the large crab but a clumsy animal alongside of the nimble ant.

It seems to be a correct principle laid down by Professor Agassiz, that in each zoological group the aquatic species are inferior in grade to those of the land.

## II. SUBDIVISIONS OF CRUSTACEA.

In the classification of Crustacea, we adopt mainly the grand divisions laid down in the excellent treatise by Milne Edwards, although

\* Classification of Insects from Embryological Data. By Prof. Agassiz. 28 pp. 4to., and one plate. Smithsonian Contrib. to Knowledge, vol. ii., art. 6.



with some modifications as to the relative importance of these divisions, and the mode of grouping. The species with *pedunculate* eyes are naturally separated from those with *sessile* eyes; and, in subdividing the latter, the large group including the Amphipoda and Isopoda are as properly separated from the other species, or Entomostraca. These steps in classification were first recognised essentially by the Swedish naturalist, Linnæus.

The Cirripeds also have sessile eyes in the young, if not in the adult, state, and might be arranged with the second of the divisions mentioned. Yet they have so many peculiarities of structure, and their habits are so different from those of other Crustacea, that they more properly form a third grand division. Though Entomostracan in the young state, they subsequently develop in a widely divergent line, producing species with a persistent shelly covering not liable to be thrown off like the skin of the rest of the body, and having a fixed instead of a migratory body, with many peculiarities of structure.

The three grand groups among Crustacea are then as follows:

I. CRUSTACEA PODOPTHALMIA.

II. CRUSTACEA EDRIOPHTHALMIA.

III. CRUSTACEA CIRRIPIEDIA.

I. PODOPTHALMIA.—The Podopthalmia have a great similarity of structure, although exceedingly diverse in form,—a diversity principally owing to the greater or less development of the abdomen. The large carapax covering the thorax, exposing only two or three posterior segments, if any, and the characters of the cephalic organs and mouth, are very uniform features for the species. A variation takes place in the number of buccal appendages, but this consists simply in the posterior pairs being either appropriated exclusively to the mouth, or being so elongated as to act the part of feet.

There are species, however, which are removed from the rest by characters of high importance; yet such species are only examples of inferior development;—that is, they are analogous in general character to the condition which the typical species present before arriving at complete maturity. Their degradation is seen in their having the thoracic branchiæ exposed, instead of covered by the carapax; and, in a lower stage, in having no thoracic branchiæ, but only similar appendages to the abdomen; and, in a stage still lower, in the branchiæ being wanting altogether, and even the abdominal appendages rudimentary, as well as one, two, or three posterior pairs of tho-



racic feet;—a condition closely analogous to that of the Cyclopacea and other species among the Edriophthalmia, in which the same thoracic feet are wanting, as well as the abdominal feet, and also the branchiæ. Thus it is that the Podophthalmia naturally include two groups,—a higher, with the branchiæ enclosed in the normal condition beneath the carapax, and a second, or lower, with the branchiæ exposed, or wanting. These subdivisions of the Podophthalmia are :

Order I. EUBRANCHIATA or DECAPODA.

Order II. ANOMOBRANCHIATA.

*Eubranchiata*.—The Eubranchiates or Decapoda are naturally divided by Milne Edwards into the three groups—

Tribe I. BRACHYURA.

Tribe II. ANOMOURA.

Tribe III. MACROURA.

The nature and propriety of this arrangement will be the subject of extended remark on a future page, where the Eubranchiata come under consideration.

*Anomobranchiata*.—In the Anomobranchiates the feet are in part two-branched or bifid, and this is an additional mark of their relation to immature forms. But this character is not universal; and, moreover, it is presented by some species of the first division. We therefore have not used the term Schizopoda for the group, but give it to a subdivision of the group which is characterized eminently by two-branched feet; while another small subdivision or tribe, closely allied in most particulars, but with simple feet (Genus *Lucifer*), forms the tribe *Aploöpoda*.\* Another portion of these species have the anterior thoracic feet clustered about the mouth, and cheliform, and this character suggested to Latreille the name *Stomapoda* (more properly *Stomatopoda*). This structure has a resemblance to that found in some Macrourea, especially the Thalassinidea, and is a proper characteristic for one of the subdivisions of the Anomobranchiata.

The Anomobranchiata will thus include three tribes:—

Tribe I. STOMAPODA.

Tribe II. SCHIZOPODA.

Tribe III. APLOOPODA.

II. EDRIOPHTHALMIA.—The *Edriophthalmia* embrace a great variety of forms and structures, with very unlike habits. Separating the Amphi-

\* From *απλοος*, simple or undivided, and *πους*, foot.



pods and Isopods, it leaves a large group, ranging from well-organized forms to the sluggish worm-like *Lernæa* on one side, and to the microscopic Rotifer on the other,—the line of gradation to the former being through the Caligacea, and to the latter through the Cyclops and Daphnia groups. Moreover, while some species have mouths with regular jaws, like the higher Crustacea, others have a trunk for suction; and in still others (*Limuli*) the jaws are but the basal joints of the legs.

May we, in view of these differences, retain all the species in a common group, subdivided in accordance with the varieties of structure? or shall we, as done by Milne Edwards, give the very highest rank in classification to the character of the mouth, and so make our first three grand divisions of Crustacea paramount to all others, the following, 1, those with proper jaws (*Crustacés Maxillés*); 2, sucking species (*Crustacés Suçeurs*); 3, those with the basal joints of the legs acting as feet?

The differences here alluded to, are, in our estimation, of comparatively small importance. They are confined to the mouth, and are simply an adaptation of the same organs to somewhat different modes of life. The sucking Crustacea have the mandibles of other species, although more slender and placed in an elongate trunk; and all other important characters are identical with those of certain maxillated species of like form and grade of structure.

In all Crustacea, the mandible is but a process from the basal joint of a leg, and the maxillæ are of like character. In the higher species, the leg or jointed portion of the organ is short; but among the lower, it often has a large development, and all the maxillæ may be like feet in form, and actually so in part of their functions. It is, therefore, but a single step, a shade beyond, which brings us to the *Limuli*, in which all the mouth organs are feet, and similar in form, the basal joints of which act together as jaws. In the *Calani* and *Cypridinæ*, true mandibulated species, the maxillæ are much enlarged, and the mandibles have long, jointed, foot-like appendages. Facts of this kind are too well known to require repetition, and they need but be appreciated, we think, to make the impropriety evident of laying that stress upon this characteristic which is done in the classification just alluded to.

We acknowledge that if this adaptation to suction occurred among the superior grades of Crustacea, it should have a high value in classi-



fiction; but in fact it is confined to the lower grades, and it indicates only subordinate divisions of the inferior group. We deem it of so little taxonomic importance, that we do not assume it as a basis of a grand distinction among the Edriophthalmia; for it appears evident that the characters of the Amphipoda and Isopoda separate them widely from the rest of the species. Indeed, the sucking Caligi are so like the Sapphirinæ among the Cyclopacea in every point of structure, except the mouth, and so close even in this organ, that they seem to be only related groups of the same subdivision—that of the Entomostraca.

Besides the species alluded to, there are also in this sub-class the Trilobita and Rotifera. The latter evidently have the lowest place. The former have been arranged both with the Entomostraca and Isopoda; but the opinion of most authors places them at present in an intermediate group. A few brief considerations on this point are offered on a following page, after our observations on the Entomostraca. The subdivisions of the sub-class Edriophthalmia are, therefore, as follows:—

Order I. CHORISTOPODA (or Tetradecapoda), including the Amphipoda and Isopoda.

Order II. TRILOBITA.

Order III. ENTOMOSTRACA.

Order IV. ROTIFERA.

I. CHORISTOPODA.—The *Choristopoda* are so called from *χωριστος*, *separate*, and *πους*, *foot*, alluding to the most striking peculiarity of these species, separating them both from the Macroura and the Entomostraca, viz.:—that the thorax consists of a series of segments exposed to view and corresponding each to a pair of thoracic feet, which feet are ambulatory or prehensile. This division of the body into distinct segments from the head to the abdomen has scarcely an exception. Yet sometimes one or two pairs of the feet are rudimentary or wanting, and one or two of the anterior segments of the thorax, adjoining the head, are obsolescent or concealed; and in a very rare case two segments are coalescent.

Among the Choristopoda, there are two prominent groups, the Amphipoda and Isopoda.

In one group, the *Amphipoda*, the abdomen is elongated, with flexible articulations; the three anterior pairs of appendages are natatory; the three posterior pairs styliform; the branchial vesicles are attached to the thoracic legs at base.



In the other, the *Isopoda*, the abdomen is short, with the articulations admitting of little flexion; four or five pairs of abdominal appendages are lamellar and branchial, and only the posterior pair styliiform.

Such are the characteristics laid down respectively for these groups. But there is another character of high importance, which has not been alluded to by previous authors, corroborative of this arrangement of the species. In the *Amphipoda*, *four* pairs of the thoracic feet are directed *forward*, and *three* outward and *backward*: while in the *Isopoda* *three* pairs are directed *forward*, and *four backward*; that is, the sets of legs are four anterior and three posterior in the *Amphipoda*; three anterior and four posterior in the *Isopoda*.

A third subdivision of the *Choristopoda* was proposed by Latreille, under the name *Lœmipoda* (or *Lœmodipoda*). The species included are characterized by having the abdomen nearly or quite rudimentary. In the more essential characters they are closely related to the *Amphipoda*, rather than to the *Isopoda*, and are not properly intermediate, nor a new type alike distinct from both; for they have the thoracic branchial vesicles of the *Amphipoda*, and the abdomen in species that have this part somewhat elongated, partakes of the *Amphipod* character. They are properly therefore *Amphipoda*, with certain parts obsolescent. That this is a correct view of their relations is shown by the thoracic feet, the four anterior pairs being forward feet, as in the *Amphipods*. This conclusion has been adopted by many Zoologists.

There are, however, true intermediate species between the *Amphipods* and *Isopods*, and if any third or intermediate group is admitted, these should be considered as constituting it. These species belong to the genera *Tanais*, *Arcturus*, *Leachia*, and others allied. Like the *Amphipoda*, they have the four anterior pairs of feet of the forward series, and the three posterior of the hinder; but like the *Isopoda*, they have the abdomen very short, and composed of six very short joints, and only the last pair of members is styliiform (instead of the three posterior pairs, as in normal *Amphipoda*), while the others are lamellar and branchial, as in *Isopods*.

We therefore recognise three groups or tribes of the *Choristopods*, as follows:—

1. *Amphipoda*. Branchial vesicles thoracic; forward series of thoracic feet eight in number.
2. *Anisopoda*. Branchial vesicles abdominal; forward series of tho-



racic feet eight in number, and used like arms, the six posterior ambulatory or affixing.

3. *Isopoda*. Branchial vesicles abdominal; forward series of thoracic feet six in number, and all ambulatory (except that one or two anterior pairs are sometimes prehensile).

The name Anisopoda, from the Greek *ανισος*, *unequal*, and *πους*, *foot*, alludes to the unlike functions and size of the anterior and posterior feet; the six posterior feet serve as feet for affixing themselves and standing; while, the eight anterior are used like arms, and are stretched out in search of food. Unlike most Amphipods and Isopods, therefore, the two sets of thoracic feet are strikingly different in function; and from the latter, they differ in that only the six posterior feet are ambulatory, and these have the additional function of enabling the animal to hold on to objects with an erect body, while the anterior members are free to move in every direction.

II. ENTOMOSTRACA.—The Entomostraca agree in a general degradation of character (by which they differ from the Choristopods), rather than in any similarity of form; yet, there are strong points which unite them. Unlike the Choristopods, the thorax does not consist of a series of seven segments following the head, with as many pairs of ambulatory, or ambulatory and prehensile feet. The abdomen, moreover, is without a regular series of appendages, either natatory or branchial, a caudal pair being usually the only one present, though sometimes, one or two preceding pairs, of peculiar structure, exist connected with the egg-system. Of the thoracic members, the posterior two pairs are, with few exceptions, obsolete, and in these exceptions they are natatory; and the three to five pairs preceding, when present, are natatory, excepting when one of them is genital in its use. These natatory feet are well seen in the groups, Cyclops, Sapphirina, Caligus, Daphnia, and others; and they are not found in the Cypris group, because three of these pairs of legs, elsewhere natatory, are here obsolete. These are striking peculiarities, removing the species far from the Choristopods; and they as closely bind the species together into a common family. Other points of resemblance are as follows:—1, the absence in general of arterial vessels; 2, the frequent diversion of the posterior antennæ to a natatory or prehensile purpose; 3, the diverse forms often presented by the anterior thoracic members; 4, the reduction of the nervous system, in most cases to a single ganglion, encircling the œsophagus, which gives out all the



nerves of the body without other ganglions in their course; 5, the absence of branchiæ, or any organs especially fitted for the purpose, in most species, and in cases where branchia-like appendages exist, they being only an adaptation to this function of some portion of a thoracic leg.

The species differ among themselves in number of segments, which in a few instances is largely multiplied, and in others, reduced to four or five, or even less; in the size of the anterior shell or carapax, which may be confined to the head, or be so enlarged as to enclose like a shell, the whole body; in the number of legs, which varies between a single pair, or even none, and fifty pairs or more; in the number of organs devoted to the mouth, from a single pair of mandibles to mandibles with three pairs of maxillæ or maxillipeds which may either be regular jaws, as in the higher Crustacea; or, may be imbedded, the basal joints of a series of legs acting as jaws; or, may project and form a moveable trunk, with slender, spiculiform organs for mandibles.

Of these differences, the last mentioned is of the widest importance. The trunk-form or sucker mouth characterizes a large number of species, which constitute a natural group, among the Entomostraca; and through these species, the class of Crustacea declines into the more degraded class of worms.

The mouth with jaws formed by the bases of a series of pairs of legs, affords a less important distinction. The aspect and structure in such species are peculiar, as observed in the Limuli, where this kind of mouth is in perfection; but, the mandibles are as much a pair of legs in the Cypris, and, indeed, they are the largest and strongest pair in these species; moreover, in the Cyclops, the jointed or pediform portion of the mandibles and maxillæ is largely developed, as already remarked. The Limuli are, therefore, but an example of the same principle, more perfectly carried out. Still, this may be a sufficient ground for placing these species in a separate subdivision of the Entomostraca, although not authorizing a wide separation from the Order.

The *Entomostraca* are, therefore, distributed here into three groups, as follows:—

Sub-order I. GNATHOSTOMATA (from *γνάθος*, jaw, and *στόμα*, mouth).  
The mouth with regular jaws, and not forming a moveable trunk.



Sub-order II. CORMOSTOMATA (from *κορμος*, *trunk*, and *στομα*). The mouth having the form of a moveable trunk.

Sub-order III. MEROSTOMATA (from *μηρος*, *thigh*, and *στομα*). The basal joints of the legs constituting the joints.

*Gnathostomata*.—Among the Gnathostomata there are species with an excessive or abnormal number of segments to the body, and lamellar appendages below, corresponding to the segments. These are naturally separated from the other species, which are essentially normal in their characters, the variations in the normal species being occasioned by obsolescence of parts, and not by increase. The former are very appropriately called PHYLLOPODA\* by Latreille, in allusion to the foliaceous character and great number of the appendages, while the latter he designated LOPHYROPODA,† on account of the fact that the feet are usually setigerous, being terminated or margined by long hairs.

The two groups include to some extent parallel forms, and admit of parallel subdivisions. Cyclops or Sapphirina of the Lophyropoda is analogous to Apus, among the Phyllopoda, and Cypris or Daphnia to Limnadia.

Moreover, these Phyllopodous species seem, in a certain degree, to be recent representatives of ancient forms, the Trilobites, which were also abnormal in the number of segments by a like multiplication. The Gnathostomata are therefore naturally divided into these two groups, the Phyllopoda and Lophyropoda.

The LOPHYROPODA contain the natural groups or tribes *Cyclopacea*, *Daphniacea*, and *Cypridacea*, as usually laid down; and the Phyllopoda, the Tribes *Branchipodacea*, *Apodacea*, and *Limnadiacea*. The graduation of the Macrourea into the maxillated Entomostraca is seen through Mysis, Nebalia, and Branchipus, as observed by Milne Edwards, all three having pedunculate eyes.

The *Cormostomata*, or sucker-mouthed species, pertain to two widely different types—one, the Cyclops type, as seen in *Caligus* (which has closely the form of Sapphirina, one of the genera of the Cyclops group), which group is named *Pæcilopoda* by Latreille; and another, the Arachnoid type, as in Nymphon, Pyenogonum, and the allied. The former pass into the Lerneæ group; the latter are like spiders in form,

\* From *φυλλον*, *leaf*, and *πους*, *foot*.

† From *λοφυρος*, *having hairy or tail-like appendages*, and *πους*, *foot*.





and have their closest analogy among Crustacea with the Choristopods, especially the Caprellidæ, the joints of the body being distinct, and the legs long and ambulatory.

*Trilobites*.—With regard to the position of *Trilobites* in an arrangement of Crustacea, we offer the following observations.

In *Apus* and *Limnadia* we have examples of species with an abnormal number of segments, and foliaceous organs of locomotion concealed below. The absence of pediform jointed appendages among all examples of fossil *Trilobites* is proof that there were no such appendages when living, as they could not have escaped preservation. A shell of a texture durable enough to be preserved, must have existed on legs sufficiently large to correspond in size with many *Trilobites*; for the articulation in all Crustacea legs is made by processes in the shelly covering of the legs, these being the only firm parts; and such articulations for large legs would require a firm exterior, or else the member would be little better than a flabby piece of flesh, even if it had articulations. It is clear, therefore, that the organs of locomotion must have been foliaceous, as in *Limnadia*. Such organs would be sufficient for swimming, and would not interfere with the adhesion of the animal, Chiton-like, to any body at hand. The antennæ in some species may have been elongated, jointed organs, as specimens have shown.

Considering these points as established, does it follow that the species were properly Entomostracans related to the Phyllopoda? One great distinction separating the Entomostraca and Choristopods—between which groups the *Trilobita* are supposed by authors to lie—consists in the existence of a regular series of organs below the abdomen in the latter, and the absence of such organs in the former. Even in *Limnadia* and *Branchipus*, the abdomen has no such series of organs.\* This part of the body in the Phyllopods is often very short, as in *Limnadia*, or narrow, as in *Branchipus*, while in many *Trilobites*, as the genus *Isotelus*, it is very broad and large,—so large, in fact, that we can hardly refuse to believe that it was provided with leaflets below, either like those of the thorax, or more properly branchial in character. In many species there is no obvious line between the thoracic and abdominal joints, as is true of some *Isopoda*, while in

\* The large posterior segment of the *Limulus*, with which the caudal appendage is articulated, and which covers foliaceous appendages, appears to be cephalothoracic and not abdominal, and the so-called tail in the common species is, therefore, all that exists of the abdomen.



others the distinction is obvious. In either case we have reason to conclude, from the breadth and extent of this part of the body, that the abdomen must have had its regular series of appendages.

On this ground, we should conclude that the species are intermediate between the Isopoda among the Choristopods, and the Phyllo-poda among Entomostracans, and properly fall into neither of these divisions, though ranking most nearly with the former in perfection of structure and general character.

The following is a Tabular View of the Classification of Crustacea, explained in the preceding pages.



CRUSTACEA.

SUBCLASSIS I. <b>PODOPHTHALMIA.</b>  ORDO I. EUBRANCHIATA, OR DECAPODA.  Tribus I. BRACHYURA. 2. ANOMOURA. 3. MACROURA.	SUBCLASSIS II. <b>EDRIOPHTHALMIA.</b>  ORDO I. CHORISTOPODA.  Tribus I. AMPHIPODA. 2. ANISOPODA. 3. ISOPODA.			SUBCLASSIS III. <b>CIRRIPIEDIA.</b>
	ORDO II. TRILOBITA.			
	ORDO III. ENTOMOSTRACA.			
	SUBORDO I. <b>GNATHOSTOMATA.</b>  Legio I. PHYLLOPODA.  Tr. 1. Branchipodacea. 2. Apodacea. 3. Limnadiacea.	SUBORDO II. <b>CORMOSTOMATA.</b>  Legio I. PEGILOPODA.  Tribus I. Caligacea. 2. Lernaeacea.	SUBORDO III. <b>MEROSTOMATA.</b>  Tribus I. Limulacea.	
ORDO II. <b>ANOMOBRANCHIATA.</b>  Tribus I. STOMATOPODA. 2. SCHIZOPODA. 3. AFLOPODA.	Legio II. LOPHYROPODA.  Tribus I. Cyclopacea. 2. Daphniacea. 3. Cypridacea.	Legio II. ARACHNOPODA.  Tr. 1. Nymphonacea.		
	ORDO IV. ROTIFERA.			







## II. HOMOLOGIES OF CRUSTACEA.

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1. *General Typical Structure of the Body.*—Notwithstanding the great diversity of forms among Crustacea, there is in general little difficulty in tracing out the typical structure through all its many modifications, and distinguishing the true relations of the parts, even in the most aberrant species.

Before entering on this subject, it is important that we should explain what we understand to be the *typical structure in Crustacea*. The investigations of Audouin and Milne Edwards have supplied the science, we think, with correct knowledge on this point. According to Edwards, the body of a Crustacean consists normally of *twenty-one* segments, *fourteen* belonging to the head and thorax, and *seven* to the abdomen. In some species, as the Choristopods, seven of the first fourteen pertain to the thorax, and seven to the mouth and anterior part of the body or head; but as the mouth-organs may become legs, and the legs mouth-organs, by slight variations, this last-mentioned division is far from general. The segments are as follows:—

- |                                   |   |
|-----------------------------------|---|
| I. CEPHALOTHORAX.<br>14 segments. | { 1st segment, ophthalmic.<br>2d segment, 1st antennary.<br>3d segment, 2d antennary.<br>4th segment, mandibular.<br>5th to 14th segments, maxillary and podal, <i>ten</i> pairs.                       |
| II. ABDOMEN.<br>7 segments.       | { 15th to 19th segments, bearing abdominal feet or appendages, <i>five</i> pairs.<br>20th segment, bearing caudal abdominal appendages, <i>one</i> pair.<br>21st or caudal segment, without appendages. |

The variations among species, as brought out by Audouin, depend on the modifications which the normal segments may undergo by enlargement, diminution, coalescence, or obsolescence, together with such



changes of form in the existing parts as may accompany either of these conditions.

The normal parts of the separate rings or segments in the Articulata should be in mind in tracing out the homological relations of species, that is, that each of these rings consists normally of eight parts or segments,—two below, called *sternal*, two above, called *dorsal*, one either side of the sternal, called the *episternal*, and one either side of the dorsal, called *epimeral*.

A different typical structure has been recently suggested, according to which the parts are multiples of the number *six*, instead of *seven*. It is based on the supposition that the organ called the posterior or lower lip by Edwards and others, is a true pair of maxillæ, to be counted with the following organs. Admitting this as correct, the cephalothorax consists normally of *fifteen* segments; the first *three*, organs of senses, the next *twelve* pertaining to the mouth and thorax, the last *six* of these twelve (the outer maxillipeds thus included) being properly thoracic, according to the hypothesis. The abdomen, according to this hypothesis, consists of six segments, bearing appendages, and a seventh, which is normally composed of three segments. This gives for the normal number of segments twenty-four, a multiple of *three* or *six*.

As the truth of this hypothesis is to be ascertained mainly by inquiring whether the so-called lower lip corresponds to a pair of maxillæ or not, we offer a few considerations on this point. The organ consists of two oblong flat lobes, in some Decapods, somewhat maxilla-like in form. We observe, in the first place, that it is peculiar in being without articulations, and in no species throughout the range of Crustacea does it bear a palpus, or any corresponding appendage. In these particulars it is unlike true maxillæ. In some Schizopoda, as the Euphausia, it is a small, quadrate plate, consisting of two naked lobes in contact on the medial line; and descending lower among Crustacea, the organ is a simple plate, with the lobes quite short and small. In the Caligi, the part corresponding to the lower lip forms the lower or posterior part of the buccal trunk. Such are in general the variations it undergoes.

Very different are the variations among the other mouth-organs. While in the Decapoda the lower lip is comparatively larger than in the Entomostraca, the maxillæ of the former are comparatively smaller than in many of the latter. Among the Entomostraca, these organs



and the mandibles as well as the maxillipeds are often enlarged into feet, the palpus being much lengthened into a pediform or natatory appendage. But this lower lip retains its fold-like character and partakes of none of these modifications, being the same essentially in the highest and lowest species, excepting a diminution in size in the latter. The mandibles and maxillæ it will be remembered form a continuous series, alike in their relations and similar in their modifications: while the lower lip, although following next after the mandibles, undergoes no corresponding variations.

It is obvious, therefore, that this organ, which is never jointed, never develops a palpus, and never takes a pediform character, is not a member of the same series with the mandibles, maxillæ, and feet, and that, in fact, it is only a fold of the skin, as generally understood.

Excluding this organ as only a lower lip, as done by Edwards and others, we have the number of segments for the cephalothorax, just *fourteen*, and those of the abdomen, *seven*. This number may be actually counted in some species. The idea that the last abdominal segment consists normally of three segments, cannot be inferred from observation. The teeth of the margin are no necessary indication of such sutures, no more than are those of the carapax.

In the legs of the higher Crustacea, the number of joints is *six*. But this number becomes *seven* if we count the episternal plate which belongs to each, and which sometimes admits of some motion.

2. *Subdivision of the Body into Cephalothorax and Abdomen.*—Before proceeding further, it is necessary to consider the actual natural grouping of the parts in Crustacea. May we distinguish three separate sections to the body, as in Insects,—a head, thorax and abdomen—or only two,—the head and thorax being united in one, and the abdomen the other? The latter is the accepted and true view. Crustacea have a cephalothorax, but not a head; and even in the very few species which have a separate antennary segment in front, it is rather an unusual development of the anterior portion of the body, than any new fundamental subdivision, for this anterior part does not include any of the mouth-organs, some of which are cephalic organs in all animal species that are said to have a head. The principal arguments appealed to, as proof of the oneness of the cephalothorax, are as follows:—The continuous succession of parts in the cephalothorax, and the absence of any constriction dividing a thoracic portion from a



cephalic, or any abrupt line of demarcation; and the fact that the mouth-organs of one species, even to the mandibles, may in others be developed into feet, and conversely the feet may become mouth-organs.

But there are other evidences of equal importance. It is a fact of much weight that the obsolescence of members takes place commonly at the extremities of the cephalothorax, and at the extremities of the abdomen. In the former, the pedunculate eyes and anterior antennæ may become obsolete at one extremity, and one, two, or three posterior pairs of thoracic legs at the other, the exterior pair in each case being the first to disappear. In the abdomen, the basal segment and the apical are often obsolete in the lower Crustacea. A table given on a following page illustrates this point.

The pedunculate eyes are absent from a large part of Crustacea, and in some Daphnidæ, the first antennæ also are obsolete. In some Schizopoda, the last thoracic feet are wanting, in others, the last two pairs; in Cyclops, the last two or three pairs; in Daphnia, the last four; in Cypris, the last *six* pairs; while the intermediate organs in each of these cases are all present.

It hence appears that the cephalothorax and abdomen should each be viewed as a whole, in which the extremities of each, according to a fundamental law, fail of developing the full allowance of members. In the Caprellidæ there is a seeming exception, since here the feet near the middle of the cephalothorax are often obsolete. But these cases do not set aside our conclusion; for the feet which fail are not the anterior thoracic feet, and therefore they do not mark or indicate any subdivision between a head and thorax. A general survey of the facts seems to show, that the cephalothorax and abdomen are each a distinct centre of development, in which progress reaches to a wider or narrower circumference in different species.

Embryology sustains us in this deduction. The abdomen in the growing germ appears as a mere point, almost as soon as a trace of the anterior part of the body appears and before any members can be distinguished, and it is a separate centre of development. In the head and thorax united there is but one other centre, and from it progress goes on either way anteriorly and posteriorly. The anterior part of the buccal mass marks this centre; the mandibles are the first organs that begin to appear, and, at the same time, rudiments of the upper lip may be traced; then the posterior and anterior antennæ commence, and the former (or the organs next before the mandibles), are most



rapid in development; next, rudiments of the eyes are seen; about this time, the maxillæ and maxillipeds are developed in succession, first the three pairs of maxillæ, then the following two pairs; and, as these continue enlarging, the feet finally become apparent, the anterior pairs being earliest. The succession is thus in a line, either way from the mandibles. The mandibles at the centre are often the shortest of the organs, and in the Decapoda, the size increases from these forward and backward, becoming largest in the posterior series, usually in the sixth pair following the mandibles (the first pair of feet in the Decapods,) and in the anterior series, in the posterior or anterior antennæ, usually the former. Notwithstanding the diversity of results, the general fact of progression from a single centre, holds true for the cephalothorax, and strongly confirms the view, that in Crustacea this portion of the body is a unit of itself.

While, therefore, *fourteen* is the whole number of successive parts or pairs of parts in the cephalothorax, we cannot properly divide them, and attribute a particular number to the head and the rest to the thorax.

3. *Homologies of the Carapax among Crustacea.*—In the study of the homologies of Crustacea, the true relations of the carapax to the other parts must first be correctly understood; and here lies one of the principal difficulties in this department of investigation. Milne Edwards has ably met the subject and arrived at the conclusion, that in the Decapods, the shell properly pertains to the *third* or *fourth* of the normal segments of the body, that is, to the *second antennary* or the *mandibular* segment. The argument on this point, drawn from certain Stomatopods, as the Squillidæ, in which all the rings or segments are distinct and may be counted, excepting the third and fourth, which appear to be blended, is satisfactory as to the main point. The same structure is found also in some of the Entomostraca; yet it is not universal among these species, as is seen in the Cyclopacea, Caligacea, and others; whose relations will be considered beyond. But the question as to *which of these two segments*, the second antennary or mandibular, the body of the carapax belongs, has not, hitherto, been decided.

Some facts have been observed by the author which lead to a conclusion on this point. It is evident, when the carapax of a crab is separated from the body, that it is an anterior segment prolonged far posteriorly; for its sides are free, and only at the *anterior* extre-



mity, between the mouth and the inner antennæ, is the lower arch complete, by a junction of the sides across the ventral surface. This anterior portion is then the true ring, and the posterior part is only a backward expansion of it; and the carapax must therefore pertain to the same segments which constitute the lower arch. This lower arch, or inferior surface (Plate 11, fig. 9 *d*), is the prælabial space (*p*), and epistome (*e e'*); posteriorly it is articulated with the mandibles, and anteriorly with the second antennæ (*a*<sup>2</sup>), whence its normal relations lie between the mandibular and second antennary segments, one or the other, or both.

The second antennæ in some cases seem to be articulated as much with the epistome inside of the basal portion of the basal joint as with the part posterior to it. But in other species, its actual, intimate connexion with the anterior margin of the prælabial area, is evident. It is often prolonged backward, much beyond the part of the epistome adjoining it on the inside; and it is frequently soldered to the prælabial plate, so as to be continuous with it, while an open suture separates it from the epistome,—a fact indicating its closer connexion with the prælabial plate. Again, as in a *Lithodes*, its direct articulation with the margin of the prælabial plate is distinctly obvious. There seems, therefore, to be no doubt that the anterior portion of the prælabial plate pertains to the same segment as the second antennæ.

In order to arrive at an answer to the question, which of the two segments, the second antennary or the mandibular, corresponds to the carapax, we have examined with some care the sutures in the prælabial plate, and those of the carapax, either side of the buccal area. The suggestions thus obtained are of considerable interest.

The prælabial plate, as is well known, has generally three emarginations in its anterior margin (*p*, *p*<sup>1</sup>, *p*<sup>2</sup>, Plate 11, fig. 9 *d*, *Chlorodius monticulosus*), and these emarginations are the terminations of sutures, which usually are readily distinguished on the surface of the plate. The median suture (*p*) extends back more than half-way to the posterior margin of the plate, and is often more open where it terminates. The next, either side (*p*<sup>1</sup>) continues backward a short distance, and then curves inward; the outer (*p*<sup>2</sup>) takes nearly the same course, and leaves an outer and obliquely posterior portion of the plate outside of it. The pieces between these sutures appear to correspond to the two sternal plates between *p* and *p*<sup>1</sup>, either side; and to the episternal between *p*<sup>1</sup> and *p*<sup>2</sup>. Now, it is the episternal, with which each of the



second antennæ is connected; and the sutures about the base of the second or outer antennæ often show this conspicuously.\* In many of the Maiadæ, the immoveable basal joint of these organs is continuous with this episternal piece, and in other species, the relation is still more evident in the manner explained above. In the *Thalamita spinimana* (from the Fæjees), the sutures of the episternal piece may be distinctly traced across the epistome, so that the base of the antennæ is thus cut off from the rest of the epistome, and the direct relation of the antennary base and the episternal piece is obvious on inspection.

This position of the second antennæ is in accordance with the established principle that the articulated members pertain to the episternal pieces or plates. This therefore confirms still further our conclusion, that the anterior portion of the prælabial area belongs normally to the second antennary segment.

The inward direction of the sutures in the prælabial surface (or palate) seems to show that the whole of this surface does not pertain to a single segment. The outer suture actually separates an outer portion, which is not included in either the sternal or episternal pieces; and also, the rather abrupt termination of the medial suture before reaching the margin behind (and in some cases divergent lines passing from its extremity parallel nearly with the posterior margin of the plate), tends to convince us that the posterior part of this prælabial plate is mandibular, while the anterior is second antennary. The mandibular portion of this plate, if these views are correct, will be the posterior margin and the part outside of the outer episternal suture ( $p^2$ ). In the *Lupa tranquebarica*, these sutures are distinct, and this outer portion alluded to, evidently has different relations from the inner.

The inferior surface of the carapax is marked in the *Brachyura* with a suture ( $r, r^1$ ), extending from the anterior angle of the buccal area to the posterior margin of the body, just over the base of the posterior legs. This suture is the "epimeral" suture of Milne Edwards, who considers the ventral piece cut off by it, the epimeral

\* The same is seen in fig. 9c, plate 16, of a *Lupa* from the Sandwich Islands. Here the epistome is obsolete, excepting its medial portion; the letters have the same signification as above;  $a^1$  is the base of inner antennæ;  $a^2$ , outer antennæ;  $e$ , epistome;  $p$ , medial fissure in prælabial plate;  $p^2$ , outer suture of prælabial plate (the suture or emargination intermediate between these two is not apparent in this species). The prælabial surface is crossed by a ridge separating the efferent canal from the rest of the surface. The connexion of the base of the outer antennæ with the anterior margin of the prælabial plate is well seen in this figure.



portion of the carapax. The suture is so marked, that in many species, even when fresh, the carapax breaks readily along its line; and generally, the suture opens very easily when the carapax has been weathered by exposure, if not before. Near the anterior angle of this ventral piece there is an oblique suture often apparent, very near the angle of the buccal area (see Plate 11, fig. 9 *d, f*, and Plate 13, fig. 6 *h*, also Plate 16, fig. 9 *e*), extending backward to the margin of this area; and it separates a small part of the ventral piece, which piece seems generally to be continued some distance backward, as a narrow margin to the ventral piece.

It becomes a question of interest, what is the proper relation of the ventral pieces of the carapax? Are they true epimerals or not? There is certainly a difficulty in the way of admitting them to be epimerals. We have pointed out the *sternal* and *episternal* pieces of the prælabial piece. Beyond the episternals, the *epimerals* normally come next in order. But the next piece is, in fact, the small plate, *f* (fig. 9, Plate 11), and then comes the larger one behind; so that, if *f* is the epimeral, as it should be, the latter is not so. This difficulty is avoided only by supposing the suture separating *f* from the part behind, to be unessential, and the whole, therefore, to be properly one piece, or the true epimeral.

But there is an additional difficulty which, in connexion with other facts, throws doubt upon this received opinion. Although each ventral piece, or rather the part *f*, actually adjoins the anterior portion of the prælabial plate, the suture *p*<sup>2</sup> is very distinct, while the outer and posterior portion of the prælabial plate passes into the piece *f* with perfect continuity, and with often a solid, shelly texture throughout. This continuity proves a closer relation with the posterior and outer portion of the prælabial plate, than with the episternal pieces themselves. It shows that the posterior portion and the ventral pieces are one united plate; and if this posterior portion of the prælabial plate belongs to the *mandibular* segment, then the piece *f*, which so solidly coalesces with it either side, is also mandibular in its relations. Indeed it seems altogether probable that this is the true view of the subject. The piece *f* is the epimeral of the mandibular segment, and *g* is the following or dorsal portion of this segment. On this ground we understand the ready disjunction of the carapax and ventral pieces; for they are actually distinct segments of the body. The forward extension of the piece *f* alongside of the episternals of the anterior margin of the præ-



labial plate, produces the suture alluded to. The carapax in this case is mainly the second antennary segment. It unites with the episternals of the same second antennary segment just at the base of the second antennæ. The suture about the plate *fg*, anteriorly is sometimes so open, that on this ground alone, we should infer its belonging to a distinct segment; and moreover it sometimes appears partly to overlie at the margin the adjoining parts, showing still farther that it is probably a separate segment.

If these deductions are correct, the epimerals of the second antennary segment or carapax are not distinguishable, even in outline. A fissure or emargination in the under side of the orbit, common in the *Brachyura*, may perhaps indicate its limit, or perhaps, some of the sutures or depressed lines on the back of the carapax; but this is only conjecture. No objection to our view can thence be urged, since there is no special reason for expecting that the epimeral should be distinct, and much less for inferring that it should be as separable by fracture, as is the case between the carapax and its ventral pieces. We are therefore led to believe, *that the so-called epimerals, or ventral pieces of the carapax, are in fact the posterior extensions of the mandibular segment.*

In the preceding explanations, we have intended to draw a line between the epistome, or rather its anterior portion, and the front margin of the prælabial plate. In many species the two are united in an unbroken surface; but in others, there is a deep and open suture, and in some, as the *Chlorodius*, referred to above (Plate 11, fig. 9*d*), there is an unossified membrane (between *e* and *e'* of the figure referred to). We have shown that the second antennæ are connected with the prælabial plate, rather than the epistome, when the distinction can be drawn. But this epistome is immediately connected, anteriorly, with the *inner* antennæ, and is continued within either side, so as to form the inner walls of the orbit. We have reason, therefore, for inferring that *the epistome (or its anterior part) belongs to the second, or to the second and first normal segments—that is, to the first antennary, or the first antennary and the ophthalmic segments.* The latter is the more probable view; for, otherwise, the ophthalmic segment must be obsolete, while the eyes that pertain to it are present. The anterior extremity of the epistome, or the inter-antennary septum, is sometimes prolonged into a spine, as in some *Oxyrhyncha*, which is more prominent than the front of the carapax; but



this is not usual among the Decapoda. In the Squillidæ, however, we find the segment pertaining to the first antennæ pushed forward and placed anterior to the carapax, and the first, or ophthalmic segment, is still more forward, or forms the anterior portion of the first antennary segment.

According to these explanations then, the carapax of the Brachyura, includes—

I. The first and second normal segments, represented by the epistome, or its anterior portion, and the inter-antennary septum.

II. The third normal segment, represented by the main body of the carapax, and the anterior portion of the prælabial plate or palate.

III. The fourth normal, or mandibular segment, represented by the posterior and outer part of the prælabial plate, and the ventral pieces of the carapax.

It remains to speak of the areolate markings in the carapax of the Brachyura, and also of the relations of the parts to those homologous with them in the Macroura.

4. *Areolate Markings on the Carapax of Crabs.*—The areas into which the surface of the carapax of Crabs is subdivided, were in part distinguished and named by Desmarest. But there is a uniformity of character and number which this author did not fully recognise.

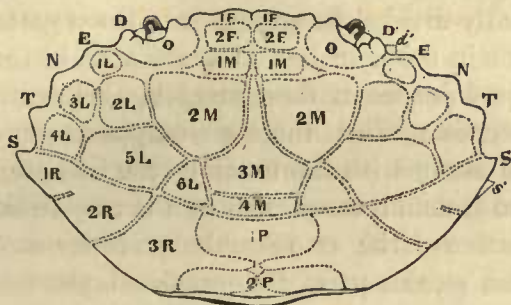
In those species of Cancroidea, which have the markings most perfectly brought out, and which exhibit best the system of areas, the carapax is divided transversely, in the first place, by a depressed line, commencing just anterior to the last of the normal lateral teeth, and crossing the carapax back of the middle; there is thus a *posterior* and an *anterior* portion.

The anterior portion is divided into three parts by depressions extending from back of the orbits obliquely inward to the transverse depression alluded to, which they meet a short distance either side of the centre. There are thus, to the anterior portion of the carapax, a *medial region*, and *two antero-lateral regions*. The medial region covers the stomach, from which it seems indirectly to derive its former outline, and includes the *gastric* and *genital* regions of Desmarest.

Near the front, between the orbits, a transverse line separates from the medial region, a region that we may call the *frontal*. And on either side, the orbits form another region, which may be designated the *orbital*.

The posterior portion of the carapax consists of a *postero-lateral* region, and a *posterior* region.

In the figure here given, the areolets of the *frontal* region are marked F; of the *orbital*, O; of the *medial*, M; of the *posterior*, P;



those of the *antero-lateral*, L; and those of the *postero-lateral*, R;—R being the initial of the last syllable of the word *lateral*, while L is the initial of the first.

The normal areolets of these several regions are as follows:—

*a. Frontal Region.*—1 F, the front margin; 2 F, a prominence just posterior to the front, either side of the middle.

*b. Medial Region.*—1 M, two small anterior prominences, the *præ-medial*; 2 M, two large areolets, the *extra-medial*, or gastric of Desmarest; 3 M, a large central areolet elongated anteriorly between the areolets 2 M, the *intra-medial*, or genital of Desmarest; 4 M, a transverse areolet, just posterior to 3 M, the *post-medial*. Two deep punctures (over processes on the inner surface that serve for the attachment of mandibular muscles), usually mark the limit between 3 M and 4 M, even when there is no depression. 1 M is here annexed to the medial, rather than frontal region, because it often coalesces with the former, and is a part of it, at times, in general outline. The whole medial region may also be called the *gastric*.

*c. Antero-Lateral Region.*—In this region there are normally six areolets:—1 L, near the first tooth following the post-orbital; 2 L, 3 L, posterior to 1 L, in a line nearly with the second tooth; 4 L, 5 L, 6 L, between 4 M and the third tooth.

*d. Postero-Lateral Region.*—This region on either side consists normally of three areolets, 1 R, 2 R, 3 R.

*e. Posterior Region.*—1 P is situated directly behind 4 M, and is sometimes well circumscribed, and occasionally has the shape nearly



of 3 M reversed and shortened; it is the *cardiac* of Desmarest, and may be so called. 2 P, directly behind 1 P, may be either simple, or, as is more common, divided into two areolets; Desmarest's designation, the *intestinal*, is appropriate.

*f. Orbital Region.*—The elevation which forms the upper side of the orbit is usually divided by sutures into three parts.

The variations in the markings of Crabs arise in the main from the greater or less prominence of these areolets, their various subdivisions or their obsolescence. When there are only a few undulations on the carapax, a little study with the normal type in view, will commonly discover that the system is there, although it may be but just apparent.

In the *obsolescence* of the areolets, the posterior are the first to disappear, and when so, this part of the surface is flat or only undulated. Next the postero-lateral fail; next, 5 L and 6 L coalesce, and also 1 M and 2 M. Next the posterior of the medial areolets become obsolete, and at the same time 5 L, 6 L disappear, or are indicated only by a slight undulation along the space that ordinarily separates them. The extra-medial may be circumscribed only anteriorly, and the slender elongation of the intra-medial be all that appears of that areolet; next, the remaining antero-lateral areolets may disappear with the frontal, and the surface is then quite smooth. 1 L is sometimes indistinct when the others are prominent, though usually it accompanies them.

When 4 L, 5 L, 6 L become indistinct, the transverse depression, described as separating the posterior and anterior portions of the carapax, may be obsolete, and the transverse line bends more forward, passing along by the side of 3 M, then anterior to 5 L, but not anterior to 4 L, in which case, the transverse line has nearly a straight, transverse course. Again, the line may pass anterior to 5 L, to the interval between the teeth N and T, or between E and N; and in the latter case it is often deep, as in the *Oxyrhyncha*.

In the *subdivision* of the areolets, the first that partake of it are 2 M, 5 L, and 3 M. A commencement of this division of 2 M, the extra-medial, is very common, and when completed, it divides it into two parts longitudinally.\* 5 L also subdivides from above across obliquely and inward; 3 M subdivides at times into three parts, as shown in some of the *Chlorodii* (see Atlas), and occasionally is farther divided. Again,

\* This is an important specific character, and though hitherto unmentioned in descriptions, is easily described when a proper notation is adopted.

2 M is not only divided in halves longitudinally, but each part is again divided. In the *Daira perlata*,\* the outer half of 2 M consists of four tubercles, and the inner of three; 1 M consists of one; and 3 M is also divided into several tubercles. In some species, a portion is separated from the anterior part of each half of 2 M, while the rest remains entire.

It is common also for 1 R to be subdivided, or to have one or two tubercles upon its surface adjoining the transverse depression S S.

*g. Teeth of the Antero-lateral Margin.*—The teeth of the margin are normally *five* in number, including the post-orbital as the first. These five, in the preceding figure, are designated by the different letters of the Latin word *dentes* (or French, *dents*), D, E, N, T, S. Each tooth is often separated from the preceding by a suture, and these sutures may be continued on the under surface. The letters hence mark properly a lobe of the margin, rather than simply a tooth.

The teeth vary by obsolescence or subdivision, like the arcolets.

In *obsolescence*, the tooth E (second), is commonly the first to disappear, this reducing the apparent number to *four*. Then N fades out, then T, leaving S alone, which also may be wanting. Again, S is sometimes smaller than T, or disappears altogether; in many species N, T, S, are all wanting.

In the *multiplication* of teeth, there is often, as a first addition, a tooth *s'* (or two *s'*, *s''*) posterior to S; it corresponds to the fold in the under surface shown at *s'* in figure 9 *d*, Plate 11.

There is often also a tooth *d'*, between D and E, on a lower level than D.

But the multiplication is generally dependent on the subdivision of the normal teeth, E, N, T, in addition sometimes to S and D; each of these teeth consisting of two or three teeth, either all equal, or one more prominent. In order to determine the normal relations of the teeth when the number is large, there is a guide in the arcolets adjoining, when they exist; for the arcolet 4 L stands against tooth T, and may be viewed as pertaining to the same lobe, it having about the same breadth as belongs to this lobe. So 3 L (or 3 L, 2 L), gives the breadth of the normal tooth or lobe N; and 1 L when present that of E. The lobes, or teeth, are often a little posterior to the arcolets, or are in the same transverse line instead of anterior to them.

\* See Plate 10, fig. 4, where the separate regions are distinguished.



5. *Carapax of Macroura*.—We have been thus minute in detailing these peculiarities of the Brachyura, in this place rather than in connexion with our remarks on that order, because the subject has an important bearing upon the homologies of the Macroura, as compared with the Brachyura, to which subject we now allude. The question is—

*What part of the carapax in the Macroura, corresponds to the ventral pieces (or mandibular) in the Brachyura?* Milne Edwards observes, that the epimeral suture in the former group crosses the carapax near its middle; and that, therefore, the whole lateral and posterior portions are the analogues of the ventral pieces, or the *epimerals*, as designated by him. This suture will be observed in several species figured in the Atlas, and is particularly distinct in the genus *Astacus*. Milne Edwards thus makes the larger part of the carapax epimeral in character.

Excepting that we consider what is here called epimeral, the *mandibular segment*, we agree with Edwards, for the most part, in the above-mentioned deduction; so that, while the mandibular segment is confined to the ventral pieces of the Brachyural carapax, it constitutes its posterior half in the Macroura.

On a hasty glance, we should hardly deem it probable that in species so closely related as the Brachyura and Macroura, the same parts should be so diverse. In the Scyllari, we may trace, on the surface of the carapax, the medial, cardiac, and other regions of the Brachyura, and in analogous positions; as though the surface had similar relations throughout. We should little think the depression between the cardiac and medial regions to be the course of a suture between the mandibular and second antennary segments, any more than it is so in the Cancroidea; yet below, there is a suture extending laterally from the anterior angles of the buccal area, which evidently corresponds to the suture in *Astacus* that is continuous across the back of the carapax in the line here pointed out. Moreover, there are no lateral pieces to the carapax. We are therefore forced to consider this suture, although in the Macroura nearly bisecting the carapax across, the same that takes a more backward course in the Brachyura, and separates only the narrow ventral pieces. There is no other suture of analogous character.

It is an important fact, in its relation to this subject, that although

the suture varies little in position in the Brachyura, still, as the species become more elongated, there is often a deep depression, corresponding precisely in its course to that of the Macroural suture. In the broad Cancridæ, having an areolate carapax, the more strongly-marked transverse depression is that which crosses just posterior to the medial and the antero-lateral regions, and terminates just anterior to the fifth normal tooth. But as the carapax elongates, this depression (which in all cases goes behind the medial region), instead of passing posterior to the antero-lateral regions, bends more forward, and terminates anterior either to the second or third normal teeth. Even in Eriphia, this depression has this forward course; and in the Oxyrhyncha, which are more narrow oblong, the depression is often strongly pronounced, and like the Macroural suture in position, both above and below, although never becoming a proper suture. The carapax seems, in such cases, to be divided across very nearly as in Astacus.

These relations just pointed out, may seem to show that the suture in the Macrourea is actually homologous with the depression in the Oxyrhyncha, rather than with the lateral suture of the carapax of these species. It certainly proves a similarity of position in the two; yet we are still disposed to infer, that the lateral suture of the Brachyura is actually represented by the transverse suture of the Macrourea. The latter have no lateral suture, and the transverse suture commences at the same point in each tribe. The Oxyrhyncha indicate, by the character mentioned, a tendency which is exhibited in a developed condition in the Macrourea. It is a foreshadowing of a structure which is not consistent with the Brachyural type, but which, when the abdomen is prolonged, as also the cephalothorax (as in Pagurus or Astacus), becomes characteristic of the body.

More direct evidence, with regard to the normal constitution of the Macroural carapax, is obtained by tracing the transitions through the Thalassinidea and Astacus to the other Macrourea. The longitudinal suture, called the epimeral by Edwards, actually exists in most Thalassinidea; and besides, there is a transverse suture crossing the back, as in Astacus, connecting nearly the middle points of the longitudinal sutures.\* The longitudinal sutures are nearly horizontal in Thalassinia, but more oblique in Gebia, very much as in Astacus.

\* See, in the Atlas, the Plate illustrating the Thalassinidea.



The anterior part of the longitudinal sutures and the transverse dorsal suture, taken together, constitute, therefore, the analogue of the transverse suture in *Astacus*. The anterior segment thus cut off, is the true first antennary; it is the only part which reaches this pair of organs. The posterior segment consists of a dorsal piece and two lateral, and cannot therefore be an epimeral to the anterior; it is rather a distinct segment, with its own epimerals separate. The dorsal segment of these three, is either narrow linear, as in *Thalassinidea* (and also in *Pagurus*), or broad, as in *Gebia*. In *Astacus*, there are traces of the same division of the posterior part of the carapax into three parts, a dorsal and two lateral, and the dorsal piece is very narrow in some species (as *A. affinis*), and broad in others. There is a close correspondence with the structure exemplified in the *Thalassinidea*. The posterior part of the carapax must, therefore, be a separate segment, and is mainly if not wholly, the mandibular segment. We say *mainly*, for in *Thalassinia* there is some reason for believing the posterior dorsal segment and the lateral pertaining to it, to include also two or three segments, more posterior, as there are transverse sutures indicating their limits. This point, and others bearing on this subject, are illustrated in our remarks on the group *Thalassinidea*.

A dissimilarity between related forms, like that described, is no unusual fact among Crustacea. In *Apus* and *Cypris*, the carapax is evidently either mandibular or second antennary, as in the *Brachyura*; for the body is attached to the shell only by its anterior portion. In *Daphnia*, closely related to *Cypris*, as explained beyond, there is a distinct cephalic suture, so that only a small anterior part of the carapax is second antennary, and all the rest is probably mandibular. Pass now to one of the *Cyclopida*. In these elongate forms, not far removed from the *Daphniæ*, the shell of the cephalothorax, instead of pertaining to one or two segments, has distinct articulations behind, making, it may be, four segments in all; one quite oblong anteriorly, and the other three or four posteriorly. The anterior one, we might, perhaps, infer from analogy, to pertain to the mandibular or second antennary; but there is sometimes a cephalic segment, as in *Daphnia*, bearing only the second and first pair of antennæ; and there is also in other species still another suture posterior to the cephalic. Thus, the subdivisions of the shell of the cephalothorax are dependent on its connexion with the body. It may, as in *Daphnia*, belong to the anterior segments alone; or, as in *Cyclops*, to a series of segments. So, in the *Eubran-*

chiates, the body of the carapax of the Brachyura may pertain to the second antennary segment, and only small ventral pieces to the mandibular; while the Macroura, in which the shell is somewhat different in its connexion with the cephalothorax, and more oblong and narrow in form (as in Cyclops), may have the suture which separates the mandibular and second antennary segments, run across so as nearly to bisect the cephalothorax. Among the Schizopoda, closely related to the Macroura, the second antennary portion of the shell is still smaller. In some Mysidæ, there is an appearance of a cephalic suture nearly as in the Pontiæ; and in Lucifer, the second antennary segment is a narrow, neck-like elongation, anterior to the main part of the carapax, from which it is separated by a suture. There are hence variations even in species of the Macroural type (under which the Schizopoda are here included); so that, while in some, the suture between the second antennary and mandibular segments nearly bisects the carapax, in others, it separates only a small cephalic segment. Its position in the Brachyura is at the other extreme, the mandibular segment being reduced to the narrow ventral portions of the carapax.

The carapax in Scyllarus is abruptly inflexed either side, as in the Brachyura; while in most of the order Macroura, the lateral surface is flat or evenly convex, and no trace of the lateral margin is to be seen except in one or more spines, in a line below the line of the eyes, which appear to mark its position.

6. *Homologies of the Lower Crustacea.*—The carapax pertains normally to the anterior segments of the body in many of the lower Crustacea. In the Amphipods and other Choristopoda, it is cut short at the seventh normal segment, and covers only what may be called a head; this head is very small, and includes the mandibles and three pairs of maxillæ, besides the organs of the senses, leaving seven pairs of thoracic feet, each pair to its own well-developed segment. The exact normal relations of the shell of the head is with difficulty determined; yet the argument that this segment extends across below, just anterior to the mandibles, and only here, probably holds in this group, as in the Decapoda, so as to show that the shell pertains either to the mandibles or second antennæ: farther investigation may possibly bring out a more definite decision.

In the preceding remarks, we have anticipated, in part, what we have to say respecting the shell in the Entomostraca. Yet we mention the facts here in place, and with some more details.



In *Branchipus*, the same structure in this respect exists as in the *Choristopods*.

In *Cypridina*, of the *Cypris* group, the shell evidently corresponds to the second antennary or mandibular segment, or both, since it is in the neighbourhood of these parts that it is connected with the body. There is a dorsal union in the vicinity of the second antennæ, and a large transverse muscle either side, for closing the shell, that passes out from near the base of the mandibles and maxillæ. It seems probable, from facts observed in the *Daphnia* and *Cyclops* groups, that both the second antennary and mandibular segments are included, and the latter, perhaps, most largely.

In *Apus* there is the same dorsal union as in *Cypridina*.

In the *Daphnia* group, as already observed, there is a distinct segment of the body to each of the natatory legs, and therefore the buckler or shell must pertain to an anterior segment, and either to a maxillary, a mandibular, or a second antennary segment. Between the cephalic part bearing the antennæ (the second antennæ alone are present) and the rest of the carapax, there is often a suture, separating the shell into two distinct parts. The anterior part is evidently the second antennary segment; the posterior must belong therefore to the mandibular or maxillary segment, and probably to the former.

In the *Cyclopacea*, there is in *Cyclops* a single segment covering the cephalothorax to the ninth normal segment, and the ninth, tenth, eleventh, and twelfth segments (the following being wanting and the twelfth often so), are each distinct. From the close relations of these species to the *Schizopods*, we might infer that the shell of the large anterior segment belonged mainly to the second antennary segment. But a suture and constriction in species of the genus *Pontia* separates a head segment which is properly the antennary. The rest of the large segment, from analogy with the *Daphnidæ*, might then be attributed to the mandibular ring. But in many species of the same genus, there is another suture or articulation intersecting this segment near its middle, between the sixth and seventh normal rings, the first of the two bearing the mandibles, a pair of maxillæ, and a pair of maxillipeds, and the second, two pairs of legs. There is in this case a very different relation of the shell, approaching that in the *Choristopods*. It appears therefore to be a fact, that in some cases when the shell grows with an attachment along the whole thorax, the annulations, corresponding to the members below, may reach the surface.

In the Caligacea, there is a subdivision of the carapax very similar to what is found in the Cyclopacea. There is sometimes a very narrow *first antennary* segment in front, distinctly articulated with the following part; then a large segment covering the second antennæ and the following four pairs of organs; next a segment bearing two pairs of legs, and then two segments each with a single pair,—the whole corresponding to eleven normal segments. The last four pairs of legs are very similar in form and structure to those corresponding in the Cyclopacea, and the only essential difference is, that a fifth pair (twelfth segment), often present in the latter for prehension in coition, is not found in the Caligacea.

The examples referred to, are sufficient to exhibit the varieties of composition in the carapax or shell of Crustacea of different tribes or families; and without pursuing the subject farther, we annex a table showing the normal relations of the segments and members for the predominant forms. In this table the normal segments are numbered in the first column with Roman numerals. The fact that the appendages of a segment are obsolete, is indicated by a zero; and that both a segment and its appendages are obsolete, by two zeros.



## A TABULAR VIEW OF

EUBRANCHIATA <i>vel</i> DECAPODA.					ANOMOBRANCHIATA.						
SEGMENTS.	CANCER.		SCYLARUS.		SQUILLA.		EUPRAUSIA.		LUCIFER.		
	Cephalo- thorax.	Artic. Append.	Br. Append.	Artic. Append.	Br. Append.	Artic. Append.	Br. App.	Artic. Append.	Br. App.	Artic. Append.	Br. App.
I.	Oculi.		Oculi.		Oculi.		Oculi.		Oculi.		
II.	Ant. I.		Ant. I.		Ant. I.		Ant. I.		Ant. I.		
III.	Ant. II.		Ant. II.		Ant. II.		Ant. II.		Ant. II.		
IV.	Mand.		Mand.		Mand.		Mand.		Mand.		
V.	Max. I.		Max. I.		Max.		Max.		Max. I.		
VI.	Max. II.		Max. II.		Maxd.		Maxd.		Max. II.		
VII.	Maxd. I.		Maxd. I.		P. ped. I.		P. bifid. I.		Maxd.		
VIII.	Maxd. II.	I. II.	Maxd. II.	I. II.	P. preh. II.		P. bifid. II.	I.	P. subped.		
IX.	Maxd. III.	III. IV. V.	Maxd. III.	III. IV. V.	P. preh. III.		P. bifid. III.	II.	P. subped.		
X.	P. preh. I.	VI. VII.	P. ped. I.	VI.-VIII.	P. preh. IV.		P. bifid. IV.	III.	P. subped.		
XI.	P. ped. II.	VIII.	P. ped. II.	IX.-XII.	P. preh. V.		P. bifid. V.	IV.	P. subped.		
XII.	P. ped. III.	IX.	P. ped. III.	XIII. XVI.	P. bifid. VI.		P. bifid. VI.	V.	P. subped.		
XIII.	P. ped. IV.		P. ped. IV.	XVII. XX.	P. bifid. VII.		0. P.	VI.	0. P.		
XIV.	P. ped. V.		P. ped. V.	XXI.	P. bifid. VIII.		0. P.	VII.	0. P.		
Abdomen.											
I.	App. I.		App. I.		App. I.	I.	App. I.		App. I.		
II.	App. II.		App. II.		App. II.	II.	App. II.		App. II.		
III.	App. III.		App. III.		App. III.	III.	App. III.		App. III.		
IV.	App. IV.		App. IV.		App. IV.	IV.	App. IV.		App. IV.		
V.	App. V.		App. V.		App. V.	V.	App. V.		App. V.		
VI.	App. caud.		App. caud.		App. caud.		App. caud.		App. caud.		
VII.	0. App.		0. App.		0. App.		0. App.		0. App.		

Obsolete.

\* In this table the following abbreviations are used:—*Ant.*, antennæ; *App.*, appendices; *Branch.*, branchiales; *caud.*, caudales; *Mand.*, mandibuli; *Max.*, maxillæ; *Maxd.*, maxil-

THE HOMOLOGIES OF CRUSTACEA.\*

CHORISTOPODA.			ENTOMOSTRACA.				
SEGMENTS.	TALITRUS.	SPHEROMA.	CYCLOPS.	CALIGUS.	PENILIA.	DAPHNIA.	CYPRIS.
Cephalo- thorax.	Artic. Appendages.	Artic. Appendages.	Artic. Append.	Artic. Append.	Artic. Append.	Artic. Append.	Artic. Append.
I.	0.	0.	00.	00.	00.	00.	00.
II.	Ant. I.	Ant. I.	Ant. I.	Ant. I.	Ant. I.	00.	Ant. I.
III.	Ant. II.	Ant. II.	Ant. II.	Ant. II.	Ant. II.	Ant. II.	Ant. II.
IV.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.
V.	Max. I.	Max. I.	Max.	Maxd.	Max.	Max.	Max.
VI.	Max. II.	Max. II.	Maxd.	P. ped.	P. nat.	P. nat.	Maxd.
VII.	Maxd.	Maxd.	P. preh.	P. preh.	P. nat.	P. nat.	P. ped.
VIII.	P. ped. I.	P. ped. I.	P. nat.	P. nat.	P. nat.	P. nat.	P. ovar.
IX.	P. ped. II.— <i>Branch.</i>	P. ped. II.	P. nat.	P. nat.	P. nat.	P. nat.	00.
X.	P. ped. III.— <i>Branch.</i>	P. ped. III.	P. nat.	P. nat.	P. nat.	P. nat.	00.
XI.	P. ped. IV.— <i>Branch.</i>	P. ped. IV.	P. nat.	P. nat.	P. nat.	00.	00.
XII.	P. ped. V.— <i>Branch.</i>	P. ped. V.	0. vel 00.	00.	00.	00.	00.
XIII.	P. ped. VI.— <i>Branch.</i>	P. ped. VI.	00.	00.	00.	00.	00.
XIV.	P. ped. VII.	P. ped. VII.	00.	00.	00.	00.	00.
Abdomen.							
I.	App. nat.	App. I.— <i>Branch.</i>	0. v. P. rud.	0. v. 00.	P. rud.	0. v. P. rud.	0. v. 00.
II.	App. nat.	App. II.— <i>Branch.</i>	0.	0.	0.	0.	0.
III.	App. nat.	App. III.— <i>Branch.</i>	0.	0.	0.	0.	0.
IV.	App. styl.	App. IV.— <i>Branch.</i>	0.	0.	0.	0.	0.
V.	App. styl.	App. V.— <i>Branch.</i>	0.	0.	0.	0.	0.
VI.	App. styl.	App. VI. stylif.	App. caud.	App. caud.	App. caud.	App. caud.	App. caud.
VII.	0. app.	0. app.	00.	00.	00.	00.	00.

lipedes; *nat.*, natatorii; *ovar.*, ovariani; *ped.*, pediformes; *preh.*, prehensiles; *rud.*, rudimentarii; *styl.*, styliformes; *subped.*, subpediformes.



*Limulus*.—In *Limulus*, the body consists of three segments, and they may be compared to the segments in *Caligus*. The anterior segment bears six pairs of members; the *first* appears to correspond to the second pair of antennæ (or third normal segment), the *second, third, fourth, fifth, and sixth*, to the mandibles and the four following pairs of members (or the fourth to the eighth normal segments inclusive). In the *Caligus*, the last pair here referred to is natatory, and the carapax is divided just anterior to it, instead of posterior.

The second segment of the body, which we consider as a continuation of the cephalothorax, and not abdominal, bears *six* pairs of foliaceous organs, analogous to the foliaceous appendages of the posterior part of the thorax, in certain *Caligidæ*, in some of which, one or two pairs of legs are combined into a broad thin plate, like an apron. These six pairs make up exactly the normal number of cephalothoracic segments,—*fourteen*. It is an objection to viewing this segment as abdominal, that in no Entomostracan is the abdomen provided with branchial appendages. Moreover, the close relation to the *Caligidæ*,—the resemblance as regards the general form and subdivision of the shell, supposing the two segments both cephalothoracic,—and the near resemblance between the foliaceous appendages and the cephalothoracic appendages, in certain *Caligi* as well as in *Apus* and the allied, are believed to be good reasons for adopting the opinion which we have here brought forward.

The *abdomen*, according to this view, is confined to the last or third segment.

7. *Homologies of the Phyllopoda*.—The Phyllopoda, in which the number of segments exceeds the normal number, offer a difficult problem to science, viz., the determination of the normal relations of the appendages. In *Branchipus*, the number of segments is twenty-two, of which *nine* belong to the abdomen, *eleven* to the body posterior to the second pair of maxillæ; *seven* being the normal number for the former, and *eight* for the latter. In *Liinnadia*, there are eighteen or twenty-seven pairs of thoracic members following a pair of maxillæ and mandibles. In *Apus*, there is a pair of mandibles, then two of maxillæ, then a large series of legs, all of which are more or less foliaceous excepting the anterior. In *Nebalia*, the abnormal character is the same, although the members are not as much multiplied.

The most natural supposition, in view of the fact that the members of Crustacea consist normally of three parts or branches, a tigellus, a palpus, and a fouet, is that the multiplication consists in these several parts (two of them or the three) becoming separate legs and at the same time having separate segments in the body, the normal basal portions of each possibly corresponding to these segments; and possibly we see some analogy also in the multiplication of branchiæ, two or three being often appended to a single leg in the Decapods.

In Limnadia, there are eighteen or twenty-seven such legs, each number a multiple of three. The form of the animal, even to its abdomen and its thoracic members, is very much like a Daphnia. In the genus *Penilia* of the Daphnia group, the number of pairs of legs is *six*, and they occupy the sixth to the eleventh normal segments, the last three segments of the thorax being obsolete, as in *Caligus* and *Cyclops*. If now the number of legs of *Penilia* be multiplied by three, it gives the number in a species of Limnadia; and again, if the number of pairs of legs in *Penilia* be increased by three (the number of obsolete segments), and then the sum be multiplied by three, it gives twenty-seven, as found in another Limnadia. The arrangement will then be as follows:—

Normal Segment	I.	Obsolete.
"	"	II., III. Antennæ.
"	"	IV. Mandibles.
"	"	V. One pair of maxillæ.
"	"	VI.—XI. Six segments with eighteen pairs of branchial plates.
"	"	XII.—XIV. Three segments, obsolete.

Or, if the number of branchial plates is twenty-seven, the normal segments VI. to XIV. (nine in number) may correspond to them.

In *Nebalia*\* there are only the normal number to the thorax, if the four pairs of two-branched or natatory members are annexed to the abdomen, as so considered by Milne Edwards.† But by this arrangement, the abdomen is abnormal in number of segments when the

\* We here take under consideration the *Nebalia Geoffroyi*, well figured and described by Milne Edwards; see *Ann. des Sci. Nat.*, xiii. 297, pl. 15; *ibid.* [2], iii. 309; also *Illust. of Cuv. Règne Animal*, by M. Edwards, pl. 72, fig. 1. The species figured by Leach, and upon which the genus was founded, has not yet been described with full details; it appears to have five pairs of natatory feet.

† *Règne Animal, Crust.*, pl. 4.



thorax is not, a condition improbable. Moreover, as the animal is much like a Schizopod, it has some bearing on this question, that the carapax covers the segments to which the four pairs of natatory legs belong, as if these were thoracic members. Again, the following part of the body, consisting of four segments, resembles an abdomen, and seems to be complete in itself, and has the number of articulations usual in the Cyclopidæ, another group to which *Nebalia* is related; and the appendages below to the first two of these joints are rudimentary and very different from those of the joints preceding. The natatory legs are very closely similar to the four pairs of the Caligidæ and Cyclops, appended to the posterior cephalothoracic segments. On this ground we conclude that the eight pairs of branchial plates, and eight segments in *Nebalia*, belong to the four normal rings, and suggest that the arrangement of the members may be as follows:—

Normal Segment I. Eyes.

- |   |   |  |
|---|---|--|
| “ | “ | II., III. Two pairs of antennæ.                                    |
| “ | “ | IV. Mandibles.   |
| “ | “ | V., VI. Two pairs of maxillæ.                                      |
| “ | “ | VII.-X. Four segments and eight pairs of branchial legs or plates. |
| “ | “ | XI.-XIV. Four segments and four pairs of natatory legs.            |

In *Branchipus*, the eyes, antennæ, mandibles and two pairs of maxillæ, belong as usual to six segments. Then there are eleven segments remaining, instead of eight. We have no evidence sufficient for laying down decisively the true arrangement; we only suggest the following:—

Normal Segment I. Eyes.

- |   |   |   |
|---|---|---|
| “ | “ | II., III. Antennæ.  |
| “ | “ | IV. Mandibles.  |
| “ | “ | V., VI. Two pairs of maxillæ.   |
| “ | “ | VII.-XI. (Five segments) ten pairs of branchial legs.   |
| “ | “ | XII. Eleventh pair of branchial legs.   |
| “ | “ | XIII. and XIV. Obsolete, as in <i>Pontia</i> among the Cyclopidæ, to which genus the <i>Branchipus</i> has relations in general form. |

This subject has a high interest, on account of the fact that the earliest Crustacea (*Trilobites*) were abnormal in number of segments, like the *Phyllopora*. They correspond to some modification of the law which now prevails in this class of animals. The basis for con-



clusions upon the homologies of these species is so unsatisfactory, that all that is here brought forward, may be received as only hints by way of suggestion, and not as well-grounded conclusions.

The excessive number of joints in the Phyllopora finds an analogy in the Vermes, and in the larves of Insects, and it is perfectly in harmony with the law laid down by Prof. Agassiz, who observes that the same peculiarity characterizes the Crustacea of the earliest geological epochs. This peculiarity is evidence of inferiority of grade, such as marks animal life of other kinds in the Palæozoic period.







## CRUSTACEA PODOPHTHALMIA.

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### ORDER I. EUBRANCHIATA.

THE subdivision of the EUBRANCHIATA or Decapoda into three groups, *Brachyura*, *Anomoura*, and *Macroura*, proposed by Milne Edwards, has been mentioned. This arrangement has been objected to by some authors, who recognise only the first and last groups as natural; the *Anomoura* being distributed between the others. On this subject we offer the following considerations. In the course of our observations we shall have to assume the correctness of the subdivisions of the *Brachyura*, which subject is discussed on the following pages.

The division *Anomoura*, was instituted for certain Decapoda having an intermediate character between the *Macroura* and *Brachyura*. When these two great groups are regarded in their embryogenic relations, the propriety of recognising such a division seems to be strikingly apparent. We observe, in this light, that the species are like marks along the several lines, between the lower and higher of these grades, some partaking nearly of the character of the higher grade, others nearly of the lower; yet they are so far distinct, that the relation of the whole is better apprehended, if they are arranged in a separate division—as a kind of transition class—than if the species are divided, and merged in the two grand divisions. Viewing the *Eubranchiata* in their relative grades, we naturally look upon the *Brachyura* as having the higher position—as higher in space, if we conceive the generic names as having a location; and, the *Macroura*, in a similar manner as having a lower position; while between the



two, partaking neither of the typical characters of the former or latter, a number of forms are arranged, that are as stepping-stones from one to the other. A subdivision into a higher, and a lower, and a transition group, is therefore, true to nature and convenient to the mind.

It is of great interest to trace out these relations; and, in order to appreciate their true value, we must first comprehend in what way, or by what characteristics, superiority of grade is exhibited. Concentration in the nervous system, has been well shown to be the basis of it, and simplicity (under certain limitations) in number of external members or parts, its exhibition. Prof. Agassiz has shown that the larger number of articulations in the body, and of limbs appended to them, form a mark of inferiority of grade. This characteristic is a mark of the vegetative quality prevailing over the animal. The caterpillar, with its long, many-jointed body and numerous legs, is an inferior grade or condition of the butterfly; in the former, the abdominal and digestive part predominates; in the latter, the cephalothoracic, or those parts by which the higher functions of the animal are performed, and the head is a single centre, in which the senses and organs of the mouth are closely grouped.

The Eubranchiata, among Crustacea, afford another illustration of this principle. It is well known, since the investigations of Thompson and Rathke, that the imperfect Crab has the long tail of the Macroura. The fact, that the Macroura are a lower grade, is therefore obvious from this analogy. Like the larvæ among insects, the abdominal portion of the body is largely developed and furnished with appendages; and usually this portion far exceeds in extent the cephalothoracic. But, in the Crab, the abdomen is reduced to its minimum, and in males is memberless; the whole force of the system is concentrated in the cephalothorax; and, even the nervous ganglia of the members, as Edwards and Audouin have well exhibited, are gathered into a single mass, while they are like distant knots in a long cord in the Macroura.

But there are other marks of superiority beside these well-known and often-mentioned facts; and the additional points to which we now allude must be understood, before we can explain the gradations among the Anomoura.

It is one distinction between Crustacea and true insects, that the former have no proper head. Among those Crustacea that rank highest, we ought to find the nearest approximation to the concentrated or

closely-grouped cephalic organs of Insecta. The MAIROID species are placed in the first rank by Edwards, and all facts sustain them in this position. Here we find the eyes and the two pairs of antennæ brought most intimately into conjunction. The narrow front of the species (unlike the broad Cancer), concurs to this end. The eyes, moreover, extend in deep orbits, nearly to the medial line; and directly beneath them, in the same line, lie the two pairs of antennæ; the inner on a narrow, longitudinal space, and the outer close alongside. The mouth-organs are much more posterior; and here Crustacea diverge from the Insecta. The Maiioidea are then the highest, as well from the organs of the senses, as the grouping of the thoracic ganglia.

This concentration is farther seen in the complete coalescence between the base of the outer antennæ and the shell below.

It is also observed in the insignificant size of the flagellum of these antennæ. With a highly sensitive nervous system, a long external appendage is not necessary. Such an elongation of these organs is to be found only as we descend in the scale. Among the Macrourea there is the largest development, and there is often an appendiculate scale or lamella, by which the surface is still more enlarged.

Passing from the Maiioidea, to the CANCROIDEA, we find the eyes and antennæ still almost as nearly in the same transverse line; the outer (or second) antennæ are, however, a little more posterior, and the inner are almost always transverse, instead of longitudinal, separating widely the outer antennæ. The eyes, moreover, are more distant at base. We detect, therefore, less evidence of the concentration pointed out in the Maiioidea;—there is a partial dispersion of the forces which are most energetic when so grouped together as to add the force of each to all, with combined effect. Besides this, the base of the outer antennæ is bounded by a distinct suture on the outer side, instead of being soldered to the shell, and in some cases of lower grade, this first joint is quite free, and may even have motion. The abdomen and sternum is still narrow, as in the Maiioidea.

These observations would place the Cancers highest among the Cancroidea, since these species have the antennary space narrow, and the inner antennæ longitudinal,—and the Portunidæ or swimming species low, as here the outer antennæ are often free at base.

In the GRAPSOIDEA, which follow next as a class, the eyes are usually



still more distant. But there are Cancroidea that approach the Grapsoid species in the distant eyes, and there are Grapsoidea which even exceed the Cancroid species in the approximation of the eyes at base. This character, therefore, would place the two groups on nearly the same level, or, we should rather say, that the grades are various in both groups, yet the average character is somewhat higher in the Cancroidea. The broader sternum and abdomen common in the Grapsoids, is proof of the lower grade of the class. The outer antennæ are small, as in the Cancroids.

In the LEUCOSOIDEA, we find the same narrow front, approximate eyes, and small antennary space, as in the Maioids, and their characteristics afford evidence of the high grade of the species. The more perfect character of the efferent channel of the branchial cavity appears to be a step beyond what is found in the other Brachyura. The prælabial plate in the Macroura and ordinary Brachyura is essentially the same; the improvement exhibited in passing from the lower to the higher grade consists in its more perfect limits anteriorly, and the more accurate adaptation of the outer maxillipeds to its borders. Another step occasionally observed, is the division of it by a low ridge separating an outer portion as the efferent channel. But in the Leucosoids, there is a higher perfecting of the branchial system, this channel being made a complete tube, through the modification of the prælabial plate—its elongation in front at middle—in conjunction with the elongation and adaptation of a branch of the first pair of maxillipeds. It is difficult to decide whether this peculiarity should be admitted as proving a higher grade in the species, or only in the branchial system alone. The existence of the ridge on the prælabial plate is not throughout a mark of superiority, since the Maioidæ have no such ridge, although unquestionably higher than the Eriphinae, in which species such a ridge exists. All the facts, however, combine to give the Leucosoids, especially the family Leucosidæ, a high rank—but little inferior, we believe, to that of the Maioids. They have a narrow, small abdomen, a well-compacted body, and often the hardest shells that occur among Crustacea. The broad form of the Calappa is only a lateral extension either side of the posterior part of the carapax.

The CORYSTOIDEA, the only remaining grand division of the Brachyura, has several marks of inferiority of grade. This inferiority is strikingly seen in the large outer antennæ, by which they approach

the Hippidea and the Macrourea; and we find these antennæ longer as the body passes from the transverse to the narrow elongate form. In the broad Trichocera, they are but little longer than in some Cancridæ; but in *Corystes*, the length is as great as in *Hippa*, and the organ is fringed with hairs through all its length.\* We see in them, therefore, the degraded Cancroid, and no resemblance to the Leucosoids. Again, the outer maxillipeds are often prolonged over the epistome, and as this is most striking in the narrower species which bear other marks of degradation, this quality may be taken as another proof of their inferior grade; they approximate, in the ill-defined front margin of the epistome, to the Macrourea.

This review of the relative rank of the different grand divisions of the Brachyura, prepares us to trace farther the gradations through the Anomourea to the Macrourea.

The peculiarities of the Macrourea which should be in mind, are as follows:—

1. A large, elongate, extended abdomen, with five pairs of appendages beneath, and another caudal pair (to the penult segment).

2. Carapax, with rare exceptions, free at the side, and not soldered anteriorly (as in the Brachyura) to the epistome.

3. Inner antennæ without fossettes, and elongated.

4. Outer antennæ posterior and often exterior to the eyes, elongated, and often having a lamellar appendage at base.

5. Front margin of buccal area not a distinct margin, and outer maxillipeds pediform, instead of opercular.

6. Vulvæ in coxæ of third pair of legs, and no copulative pouch.

7. No sella turcica or median apodeme.

8. The nervous cord elongated down the abdomen, and having a series of ganglions.

9. Branchiæ usually more than nine in number.

10. The carapax without a suture along the sides, but when any exists, it crosses the middle of the back; that is, as has been explained on a preceding page, the mandibular segment instead of forming only the margin of the carapax either side, constitutes its posterior half when any distinction of the segments is to be discovered.

\* It should not be understood that we consider small antennæ a necessary mark of higher grade; on the contrary, it is possible that the organs may be obsolescent, and so mark inferiority, as in *Acanthocycelus*. We allude only to a general principle, the point of which must be obvious without further explanation.



We here give only a summary of the prominent characteristics, in order to illustrate thereby the gradations into this type from the Brachyural.

From the high rank of the typical Maiioidea, the first point of degradation seen is in the Parthenopinea. They are the Cancroid forms of this group, having the short epistome of the Cancroidea, and the base of the outer antennæ usually bounded exteriorly by a suture, and commonly a rather broad front, though still rostrate.

The second step in degradation is to the Oncininea, the outer antennæ being here wholly free and cylindrical. Moreover the two posterior pairs of legs are prehensile. The other characters pertain to the Maioid type, and are in accordance with the typical Brachyura.

The grade next lower carries the series below the true Brachyural level. Either the branchiæ are more numerous; or the outer antennæ are posterior to the eyes; or the inner antennæ have no fossettes; and in connexion with one or the other of these marks of degradation, the vulvæ are peculiar in being situated in the basal joint of the third pair of legs, as in the *Macroura*, instead of in the sternal plate, as in the Brachyura; and the abdomen begins to show some traces of increase, either in its appendages, or size, or both. Besides, the posterior legs are more or less prehensile, as in *Oncinopus*, and also much smaller than the others,—this smaller size, both here, and where it occurs in the *Macroura*, being a mark of low grade. Internally, the sella turcica, median apodeme, and female copulative pouch, are wanting.

This degradation is seen in *Latreillia*, an Inachoid form; the posterior legs being shorter and prehensile—the anterior antennæ without fossettes—the posterior antennæ arising from behind the eyes—the vulvæ in the base of the third pair of legs—the sella turcica and median apodeme wanting. The species, however, have the Brachyural number of branchiæ, and the habit of a *Leptopodia*.

It is observed again in *Dromia*, a Trichia-like form. The genus *Trichia* is of the Parthenopinea group, and is Libinioid in aspect; it is a transition genus between the Parthenopinea and the Dromioids. Here the antennæ are as in the Parthenopinea; but the four posterior legs are prehensile, the branchiæ abnormal (fourteen) in number, the vulvæ, sella turcica, and median apodeme as in *Latreillia*. The abdomen in both these genera is small, yet in the last, there are traces of a transition character.

A still lower degradation of the Maioid type brings us to *Lithodes*



and Pagurus. In these genera, the eyes are anterior to the first antennæ, even pertaining to a separate annulus, and the second antennæ are still more posterior, and usually exterior to the eyes. Thus the concentration and close conjunction of the organs of the senses, so characteristic of the typical Maia, gradually fades, and these organs instead of being combined, begin to take on an arrangement in series like the posterior members of the body. The abdomen is also largely developed, and in Pagurus a pair of appendages to the penult segment unites with the last segment in forming a caudal termination to the body, like that of the Macroura. The posterior thoracic legs are short; and other characters show the grade of the species to be but little removed from the true Macroural type.

Descending still lower, we come into the range of the Macroura. The family which appears to represent the Paguri, is the Thalassina group. This is seen in the form and markings of the cephalothorax; the characters of several of the legs; the first and third pairs of maxillipeds; and the outer antennæ mostly without an appendicular plate. The abdomen has the true Macroural character, being fully elongated, and furnished with a range of appendages below, in both sexes. On a still lower level, we find this type again represented in the Squillidæ, to which group, certain of the Thalassidea show an approximation. The Squillidæ, without thoracic branchiæ, are among the lowest of Crustacea with pedunculate eyes, and belong to the group *Anomobranchiata*.

We have thus followed the Maioid type in its degradations to the Macroura, or even below this level. We may pursue the same course, though not in all cases to the same extent, with the other grand divisions.

It was seen that the Maioid series passes down from the Parthenopinea, the lower type of the division. An obvious series direct from the Caneroidea, passes through the Corystoidea, which have a relation to the Cancroids somewhat similar to that which the Parthenopinea have to the Maioids, excepting a wider separation. The group into which the Corystoidea leads is the Hippidea. The form of the narrower species approaches Hippa; the antennæ are very similar: the legs in the swimming species show an approach to this group; and in general aspect, also, there is much resemblance. But in the Hippidea, the abdomen is much elongated and has appendages either side of the last segment; the last thoracic legs are short, and the species present the various other characteristics which widely



separate them from the Brachyura. We do not attempt to point to any genus among the Macroura representing the Hippidea. Another line from the Cancroidea passes through *Acanthocyclus* to *Corystoides*, the latter genus having, like the Macroura, no fossettes for the inner antennæ, and both differing from the true *Corystoidea* in the outer antennæ being obsolete. *Bellia*, according to Edwards, has like characters nearly with *Corystoides*.

The Grapsoid species are represented of a degraded form in *Porcellana*, and the particular connecting genera appear to be *Grapsus* and *Plagusia*. The articulation of the fourth joint of the outer maxillipeds with the outer angle of the third joint, shows that the type is Grapsoid. But here the abdomen is enlarged and partly free; the lateral appendages of the caudal extremity are large; the outer antennæ are posterior and exterior to the eyes; the posterior thoracic legs are small and dorsal; and various other characters separate the species from the Brachyura. While, at the same time, the inflexed abdomen, with only a single pair of appendages in the male, the inner antennæ with fossettes, the outer maxillipeds covering tolerably well the buccal area, and the general habit, are far from Macroural in character.

A still lower grade of this type is seen in *Galathæa*. The general characters are similar to those of *Porcellana*; but both thorax and abdomen are more elongated, and the habit is rather Macroural than Brachyural, and there are even present in males, the full number of abdominal appendages. But, as De Haan with his usual acumen has detected, the carapax has the lateral suture of the Brachyura. It appears then to be a group closely on the confines of the Macroura, if not properly one of that division.

Through *Galathea*, we believe we may point out a passage into the Macroural dominion by *Æglea* to *Astacus*. *Æglea* has the branchiæ of the *Astacus* group, consisting of clusters of minute cylinders, and thus is not of the *Galathæa* family, although similar in habit and in the posterior thoracic legs. We should thus connect the Macroura with the Brachyura through two lines, one by *Callinassa* and *Pagurus*, and the other by *Astacus* and *Galathæa*.

The Leucosoid type is found only in a single degraded form,—that of the *Ranina* family. The species are nearly like Brachyura in many characters. Yet the inner antennæ have no fossettes; and the vulvæ are in the base of the third pair of legs. The mouth is nearly as in *Leucosia* or *Matuta*, and the feet are swimming feet, as in *Matuta*. The first step towards this degradation is seen in *Dorippus*,

in which the feet of the two posterior pairs are short and subdorsal, as in *Dromia*; yet the essential characters are all Brachyural. De Haan points out a relation between the *Ranina* group and *Homarus* among the *Macroura*, mentioning a resemblance in the inner branch of the first maxillipeds, which is narrow and elongate, and also in several other characters.\*

From these facts with regard to the gradations of the species, it is evident that we present a clearer view of the relations, if we keep the Brachyural and Macroural groups distinct, each at its own level and within its own circumscribed limits, and place the intermediate links in a separate group, as proposed by Edwards. We may thus more readily point out and exhibit these links and gradations. The mind in its conceptions of the range and relations of the several groups, imagining the interlinkings to take place among points in space, would thus locate them. We therefore believe, that the group *Anomoura* is established on philosophical grounds. Its diversities of types are not greater than are found among the *Brachyura*, although more striking as they occur among so small a number of species.

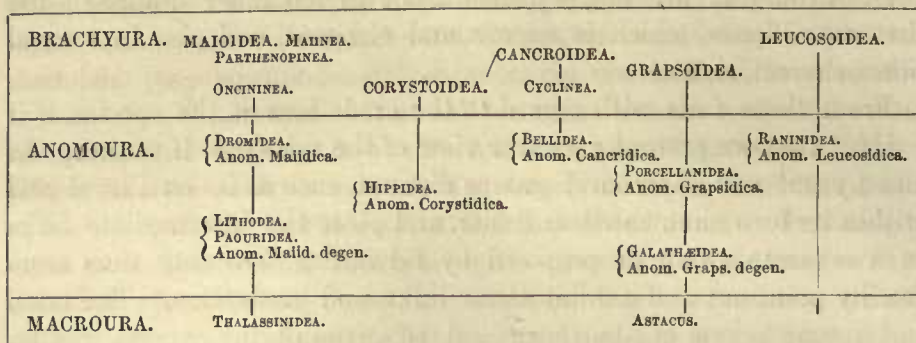
Some interesting points will be developed on a farther consideration of the subject.

We have found that the *Maiioidea* are connected with the *Macroura* through *three* distinct grades of degradation, following *Oncinopus* and *Trichia*,—i. e., the *Dromioid*, the *Lithodioid*, and the *Paguroid*. Below the *Corystoidea* we distinguish but one grade. Again, below the *Grapsoida*, we find but one (*Porcellana*) until we reach *Galathæa*, just on the confines of the *Macroura*. The greater number of distinct gradations between the *Maia* and *Macroural* type is a consequence, evidently, of the high pre-eminence of the *Maia* type. Counting *Parthenopinea*, and *Oncinopus*, as two proper grades in the descent, we may distinguish five in all. From the *Cancroids* (ranging in the same grade nearly with *Parthenopinea*), we pass to the *Corystoidea*, which is a longer step than from *Maia* to *Parthenopinea*; and thence to *Hippidea*, which ranges at a lower level than *Dromia*, and a little above *Pagurus*. From *Grapsoida*, still lower than *Cancroidea*, we pass to *Porcellana*, nearly on the same level with *Hippa*, and thence to *Galathæa*, but just above the *Macroura*. I have attempted to represent this relative grade by the relative level or height in the following table; and, although a rude representation of nature, it gives some

\* *Crust. Faun. Japon.*, p. vii.



idea of the gradal relations of the groups. I give only the prominent and obvious lines of relation, and not the many interlinkings of affinities or convergences between the several lines.



This system of arrangement gives a very different view of the affinities and gradations of species from the circles of De Haan, and, we think, one that is more just to nature. Indeed, we deem the "circular system," as it is called, a splendid failure, in the effort of mind to compass the kingdom of life. It was a brilliant scheme when first brought forward, embracing much respecting the relations or affinities of species that then seemed almost like a new revelation; but as the first glare has now passed, we can perceive that while it attempted to rid science of the straight and rigid bars of artificial systems, it only modified the mode of coercion, by bending the bars into circles. There are neither straight lines nor circles in nature, but main branching lines, with subordinate branches, and almost endless reticulations or anastomoses, by curves of all kinds and of all grades of divergence and convergence.

According to the above explanations, we may consider—

- The DROMIDEA, as the Anomoura Maiidica.
- The LITHODEA and PAGURIDEA, as the Anomoura Maiidica degenerata.
- The BELLIDEA, as the Anomoura Cancridica.
- The HIPPIDEA, as the Anomoura Corystidica.
- The PORCELLANIDEA, as the Anomoura Grapsidica.
- The GALATHEIDEA, as the Anomoura Grapsidica degenerata.
- The RANINIDEA, as the Anomoura Leucosidica.

We may distinguish thence four grades of the Anomoura.

I. ANOMOURA SUPERIORA.—*Dromidea*, *Bellidea*, and *Raninidea*: closely Brachyural in most characters; eyes not anterior to inner antennæ in

position; outer antennæ sometimes posterior to eyes, but not exterior; abdomen small and applied closely to sternum; caudal extremity without lateral appendages.

II. ANOMOURA MEDIA.—*Hippidea* and *Porcellanidea*: eyes not anterior in position to inner antennæ; outer antennæ posterior and exterior to eyes; caudal extremity with lateral appendages; abdomen rather large and free, or laxly applied to the sternum.

III. ANOMOURA SUBMEDIA.—*Lithodea*: eyes anterior in position to inner antennæ; abdomen broad and not symmetrical, without caudal appendages; second, third, and fourth pairs of feet, similar.

IV. ANOMOURA INFERIORA.—*Paguridea* and *Galathæidea*: eyes anterior in position to inner antennæ; abdomen large, hardly inflexed, and having lateral appendages to caudal extremity.

Reaching the Macroural level, we find no longer a few species only to a type, as in the Anomoura; there is a vast development of forms with even a smaller variety of types. A distinct system of structure is arrived at, which is not of the nature of a transition or mixed style of insect-architecture, but a perfect and simple style of itself, and upon this system as a basis, the number of modifications is exceedingly large. There is a surprising fertility in the expressions of the one idea exhibited in the Macroural structure, and we cannot fail to admire the infinity of resource displayed—which is the more wonderful as it is not developed where the diversity of types and grades favoured diversity of forms, as in the Anomoura, but in a single grade, and as the development of a single defined thought.

Among the Macroura there are not those marks of imperfection found in the Anomoura. The posterior thoracic legs are well developed; the abdomen is not a sluggish unwieldy mass, as in the Paguri, but has a graceful outline and members to aid in its motions; and the general figure of the body has not the half-finished aspect, the abortive appearance, and clumsy limbs, which are so unlike either the true Brachyura or Macroura. There is a balance in the forces, which gives perfection to every organ, and all portions are like the well-ordered parts of a harmonious structure.

In rising from the Macroural grade to a higher, the great point of progress lies in the more efficient or concentrated character to be given to the organs of the senses; as these are the centres of force, they are therefore highest in the power required for elevation.

Among the lower Brachyura, the Grapsoidea, the posterior legs are



often disproportionably smaller than the others, and it is this pair which takes the swimming character in the natatory species—this form being of a lower grade embryologically, than the gressorial. In a grade below the *Macroura*, the *Anomobranchiates*, these same legs are again found to fail of development.

It is a fact worthy of notice, that the genus *Dromia*, which is higher than *Latreillia* or *Homola*, in having fossettes to the inner antennæ, has a mark of a lower character in having two pairs of legs dorsal and abbreviated instead of one. But may not the condition of the cephalic functions have a relation to the latter? May not the cephalic progress towards the Brachyural type, show in what way or degree the forces were exerted in the different directions in these different Anomoural forms?

Taking the space between the mandibles and the first pair of antennæ, as the region which may be called the centre of development, since this part first appears in the progress within the egg, and looking upon the succeeding developments as going on anteriorly and posteriorly in the cephalothorax from this point as a centre, the actual distance to which such a development of members goes on, may be regarded as inversely as the force required for them. The greater the force required, the less the distance.\* The large amount of force required for the cephalic organs (the senses), is thus indicated by the shortness of the distance, and the more perfect the concentration or close conjunction of these members (which is equivalent to the shorter the space, provided the results are well perfected), the higher the grade of the species, and the greater the concentration of force expended in the result. The formation of the cephalic organs precedes that of the thoracic legs, yet not their completion. They have an earlier existence, but their perfection goes on in continued progress as with higher orders of animals, and they are not ordinarily finished until the whole form is complete. Hence, while the successive developments are going on posterior to the mandibles, there is successive progress anterior to them, and the centre still holds its first position. When then, as in *Latreillia*, we find the cephalic organs disjoined or separated, we observe in this fact, evidence of that same

\* That is, the distance to which the development of members goes on, and not mere development of the shell, as in the growth of the beak, or some analogous enlargement of vegetative character.

diminution of force which is exhibited by the partial development of the posterior pair of legs. The force is exerted in an animal modelled after the Brachyural type; and a failure or decrease of energy in one direction has its almost necessary parallel in diminished energy at the other extremity; the first antennæ without fossettes, and the second antennæ behind the eyes, balance the abbreviated posterior pair of legs. It is not until the grade of the senses is of a lower order, requiring less force for development, and a type is assumed which has the anterior or cephalic part more prolonged, that we find again the posterior legs fully formed; and this type is the Macroural. In the Macroura, as in the Brachyura, the forces are well balanced, and every part has its full development; they represent, as we have said, two distinct *styles* of structure, and the only two among the species under discussion: the Anomoura are a transition grade, or a mixed style.

In Dromia, the broader front and more distant eyes indicate, as in the Parthenopeina, some degradation from the high Maia rank. The senses are of a lower order, and their development, hence, requires less force; and consequently, although the antennæ, as regards the fossettes and relative position, are more as in the perfect type, this alone is not a mark of superiority. There is a sluggishness in the animal that is proof of the low condition of the senses. The progress of growth anterior to the centre of development, for these reasons, may actually require less force, as compared with that required posteriorly to finish out the full Brachyura, than in Latreillia; and hence the *two* posterior pairs of legs in Dromia are abbreviated. The abbreviation of the carapax behind in most Anomoura, is another mark of the same general principle—not a necessary though common fact.

It may be said, that the object of the shorter hind legs of the Dromia and allied species is sufficiently shown in the uses to which they are put,—their enabling the animal to cover its back with shells or foreign substances, and that we need not look to any principle like that here brought forward. But this resource is necessary to the animal only because of its inferior character. They have not the agility, or strength, or wit of the true Brachyura; and hence take the clumsy aid of some foreign body or material, for self-defence. They have an order of senses or a nervous force approaching that of the Macroura, but placed in a system, that of the Brachyura, which is wielded with vigour only when nerved after the full Brachyural mode.



The use of the hinder legs in these species is therefore additional evidence of their degraded system. The structure is not a primal idea of itself, but a result of the same cause which has degraded the senses, and given the whole character to the species.

In these observations we favour no monad theory: we simply endeavour to illustrate the general law or plan which the Infinite Creator exhibits in his works.

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#### TRIBE I. BRACHYURA.

BEFORE offering remarks on the special classification of the Brachyura, it is important to enter upon some general considerations with respect to the importance of different organs as a basis of classification.

It has already been explained that no *à priori* reasoning can prove satisfactory; for there must be a special study of the objects to be classified, before the value of the characters exhibited, even by one of the highest order of organs, can be accepted as of paramount importance. We have illustrated this on a preceding page, by alluding to the great discrepancies that exist among the different departments of Crustacea, as regards the organs of the vital functions. The nervous system is evidently the highest in its influence upon the vital energies of the species, and its characters afford the most striking distinctions between the several grand divisions in Zoology. Yet, general structure and plan of embryological development have a more exalted importance; and though no nerves may be detected in certain Radiata, they are Radiata still, and are not thereby removed from other species in which such nerves may be distinct. It might seem *à priori* very improbable, that species in which there is but one thoracic ganglion with radiating nerves, should be intimately related to species in which there are half a dozen or more ganglions, at intervals in a long cord; yet the nerves, though so unlike, are found to be indicative of only a narrow divergence, merely that which divides the Brachyura and Macroura. The general relations of structure, as exhibited in

the succession of parts forming the body, the similarity in the modes of aeration, in the organs of the senses and the mouth, are evidences of a common type, and a general resemblance of habit or mode of life; and a study of the embryology of these Crustacea, explains this close typical affiliation. The value of any characters is hence to be ascertained by a direct study of their bearing among the various species.

It should be remembered, moreover, that the characteristics mentioned in a description are not always the fundamental differences, though as far as possible they should so be. The several fundamental differences may be indicated perhaps by a mere angle in the shell; and hence, when this is found to be the case, the peculiarity of this angle is often mentioned, and the fact it indicates left untold. It is, therefore, a general truth, that external characters are often of value, not for what they are, but rather for what they indicate. In one division, a character may be of the very lowest importance, distinguishing, possibly, only species, when it separated families or tribes in another department. The pointed front of the Maioid Crustacea is characteristic; for there is a range of peculiarities at once suggested by it. But this form was allowed in the early stages of the science, to gather many species into the same division with the Maioida, which have since been shown to be widely separate. The character is valuable for what it indicates, and not for itself alone. The long anterior legs of the Parthenope group afford an obvious characteristic for the group; but this is not the important characteristic, but only an external mark of actual peculiarities. The long posterior legs of certain Maioid species have been allowed to have the same value in Taxonomy; yet in fact, this character in itself indicates no other difference of any moment, and is, therefore, of little real value as a source of distinction. Yet if, in any subdivision of the Maioida, this peculiarity should be found to be a regular attendant upon other important peculiarities, it would become a convenient and useful means of characterizing the group or groups.

In searching for characteristics of the natural groups among the Brachyura, we should, perhaps naturally, look first to the *nervous system*. Yet, it is generally true, that this system does not undergo variations correspondent with the minor subdivisions in Zoology. It has its several types of structure, and under these types it is accommodated in its character to the various forms of species, rather than to differences in other functions or in habits.



We next look to the *nutritive system*. But this system, among the Brachyura, is very uniform in character. The mandibles, the organs which should be the first to exhibit any fundamental distinctions, are of one type; having a simple cutting edge and but slight variations in form, or in the character of the jointed appendage. These organs are the earliest in embryologic development, preceding even the antennæ, and this fact would give to their distinctions, if there were such, a high value in classification.

With regard to the organs following the mandibles,—the maxillæ and maxillipeds,—there is no *à priori* ground for giving to their characters a primary rank. They are related normally to the legs which follow, and are not a necessary part of the nutritive system, and moreover, are subsequent to the antennæ and eyes in embryological development. In those of their peculiarities which have *especial reference to the functions of the mouth*, their variations of form are mostly of little value.

The exterior maxillipeds may vary widely in the same family or even genus, or may have the same characters through very different groups. The variations of the widest importance are in the articulation of the fourth segment with the third, which may take place at the inner apex of the latter, its summit margin, or outer apex. A large division of the Brachyura is characterized by the first of these three modes, and another group of natural limits (Grapsoidea), by the second and third.

It should be observed, that there is a liability to error in referring some examples to the second of these modes. It not unfrequently happens that the third joint is much elongated along the inner side, and is also obliquely truncated, as usual towards the summit on this side; and in consequence, the summit margin, instead of being horizontal or nearly so, slopes very much outward, or may even be nearly longitudinal. In such a case, the fourth joint, to the view, is articulated with the summit of the third joint, although normally with the *inner apex*, the summit and inner apex being really the same part. There are many cases of this kind. *Eurypodius* is an example of this elongated third joint; while in the genus *Oregonia*, to which it is very nearly related, the third joint has the ordinary shorter form, and the articulation with the inner apex is distinct.

The relative lengths of the second and third joints of the outer maxillipeds afford distinctions often of generic importance, and so also

some peculiarities in the palpus; but even for generic distinctions, they may be too much relied upon.

We have observed above, that the mode of articulation between the third and fourth segments of the outer maxillipeds distinguishes the Grapsoidea. Yet it should be understood, that while this is true, this is not the most prominent characteristic of the Grapsoidea.

The mouth area, besides subserving the purposes of the mouth, is also, the place for the passage of the waters used by the branchiæ in aeration. The current flows over the prælabial plate, beneath the maxillipeds. This function involves modifications in the buccal organs which are of great importance. But the considerations connected with this point properly relate to the *system of aeration*.

The *branchial system* is one from which we should particularly expect important distinctions and valuable characteristics of the highest significance; and such distinctions exist. They are at the basis of some of the primary subdivisions, as exhibited in the system of Milne Edwards, and to a large extent, also, in the system of De Haan. A large group of species, the Leucosoidea (Oxystomata of Edwards), have the buccal area narrowing forward, sometimes nearly to a point; and this is not due to any peculiar modification of the nutritive system, but to an adaptation of the buccal area to certain peculiar modes of aeration. In these adaptations in different groups, the part of the buccal organs especially devoted to the branchial system (apart from the basal appendages or "fouets") is the inner branch of the first pair of maxillipeds (or third maxillæ). This lamellar branch covers the efferent branchial current, forming a covered passage for it, and, as well illustrated by De Haan, it is especially devoted to this purpose, the water flowing beneath it to the anterior margin of the buccal area, where it passes out. This thin plate, which is but a small appendage to the first maxillipeds, has hence a high functional importance.

This efferent passage from the branchial cavity, in a large part of the Brachyura, covers each half of the prælabial plate, or else the outer portions of each half; and in many species, when the latter is the case, there is a small longitudinal ridge on the prælabial plate, separating the efferent passage from the rest of the plate. The importance of such a ridge as a means of distinction, is hence obvious. It is of higher value than the greater or less breadth of the inner maxilliped branch that covers the passage, or the fact that this branch has a straight or sinuous margin, or some other like modification.



Most of the swimming Cancroidea have this ridge prominent, and the lamellar maxilliped branch is rather narrow. But in a *Lupa* (*L. cribraria*), this ridge is wanting, and the lamellar branch is quite broad, covering the praelabial plate to its centre. This is a striking instance of a wide discrepancy among species that have hitherto been referred to a single genus. The completeness with which this lamellar branch of the first maxillipeds is adapted to cover the efferent passage, varies much in different families; it is not always wide, as in the *L. cribraria*, when the ridge alluded to is wanting.

The larger part of the Brachyura have the characters just described. But in another part, the efferent passage, instead of passing over the *outer* portions of the praelabial plate, passes inward and makes its exit by the *middle* portion, which is prolonged forward. These are the Leucosoidea or Oxystomata (sharp-mouthed Crustacea). The narrow anterior limit of the mouth forms the place of exit for the pair of efferent passages; and by means of a ridge, and the same lamellar maxilliped branch, here much elongated and narrow, the efferent passage is made a complete tube, well inclosed. This passage, it will be perceived, passes *inside* of the ridge in the Leucosoidea, and *outside* of it (or outside of the position it would occupy, if there is none) in the other Brachyura. The afferent passage, in such cases, may occupy the outer portion of the buccal area (that is, the same part that is the efferent in all other Brachyura), or it may enter from a point posterior to the mouth, in which case it is like other Brachyura.

The branchial system also varies in the number of branchiæ, though not in their structure. But this variation in number is only a variation in the amount of surface exposed to aeration, or rather, in the number of subdivisions. It is of less moment than the striking difference in the mode of carrying on the branchial function, between the Leucosoidea and other Brachyura. The triangular mouth of the Oxystomes, is hence, a significant characteristic,—not as to mode of nutrition, but of aeration. De Haan, in his system, has well exhibited this prominent peculiarity of the Leucosoidea, and has drawn out with more strictness the limits of this group than is done by Edwards.

The *system of reproduction*, next to the branchial, affords characters of the widest bearing in classification. But these characters are observed in the position of the external parts, rather than in internal peculiarities. The connexion of the male verges with the posterior

segment of the thorax is universal. But in a large portion of the species, the verges proceed directly from the base of the posterior legs; while in another large group, they pass from the sternum inside of the base of the legs. This important distinction is well used in the classification of Crustacea by Milne Edwards, and is neglected in that by De Haan. In fact, the position of the verges is nearly the same in all, as regards distance from the medial line; and the difference in the external position arises from the greater or less width of the sternum behind, which in the Grapsoidea throws the posterior legs farther from the medial line. The female vulvæ are situated in the sternal plate.

Passing from the branchial system, we next appeal to the *organs of the senses* for distinctions. But here the differences among different groups are mostly small. The *eyes* may be longer or shorter pedunculate; but mere variations in length of peduncle is a character of a low grade. They may arise from near the medial line of the body, or remote from it,—sometimes a generic distinction and rarely of higher value. They may have distinct orbits for retraction, or be without such orbits,—a characteristic of considerable importance. They may have the eye at the extremity of the peduncle, or the peduncle produced beyond the eye,—a striking instance of an anomaly which is only trivial in value.

The two pairs of *antennæ* are organs of high rank, and afford important distinctions, as would be gathered from the remarks on the degradation of species, on a preceding page. The condition of these organs is one of the most prominent marks of grade or rank. Yet it should be noted, that in each of the several divisions of the Brachyura, similar variations of grade exist, and the characteristics they afford are not superior to those of general structure.

The *inner antennæ* may be longitudinal or transverse. When the former, it is owing to the narrowness of the space between the eyes, and the closer approximation of all the organs of sense, and as already explained, this position is often a mark of the higher grade, it characterizing preeminently the Maia group.

The *outer antennæ* vary in position with reference to the eyes, and also in the condition of the basal joint. They are sometimes so situated that when the animal is in its natural position, the first basal joint is directly beneath the eye and extends forward beyond it. Such species—the Maioidea—have the front narrow, and the basal joint is soldered firm to the shell outside. Combined with the form, it is an



important distinction. In many other Crustacea, like the Cancroidea, the basal joint is situated inward of the eyes, and more posterior, and rarely projects beyond them; besides, instead of being soldered continuously with the shell outside, it is separated by a distinct suture, though still immoveable. In other species, still, the antennæ have free motion from their very base. These are both marks of a lower grade than that exhibited by the concentrated and consolidated condition in the Maia type.

The outer antennæ are usually quite small and naked, or nearly so, and extend forward and outward. But in one group (the Corys-toidea), they are generally long and hairy or ciliate, and extend inward and forward.

In *structure, form, and organs of locomotion*, the differences are mostly of small value, characterizing genera rather than higher groups. Yet *form* is important, when sustained by other characters. Among the Leucosoidea there is a strange diversity of shape; the broad convex Hepatus, the still broader Calappa with thin extended sides, the globular Ilia, and narrow-snouted Leucosia, Ixa with its sides lengthened into cylinders, and the thorny Iphis, make a fantastic group; yet all are of one tribe. But among the other Brachyura there is much less variation. The oblong Maia, narrowing anteriorly, is widely diverse from the broad Cancer, with its arcuate front margin, and as diverse from the square Grapsus; and these several forms are characteristic of as many groups, though liable to variations of considerable amount. The narrow head of the Maia throws the bases of the eyes almost in contact, and places these organs over the base of the outer antennæ; at the same time, while the front is elongated, the epistome is long for its breadth, and a narrow, oblong space is left for the inner antennæ, which are therefore longitudinal. The broader form of the Cancer allows the eyes to be distant, the base of the outer antennæ to be interior to them instead of directly beneath, and as the front also is not produced, the epistome is very short, and the inner antennæ are usually transverse. Yet even with the broad form, the bases of the eyes may be nearly in contact, as in Ocypoda; and since in these species the front is not lengthened into a beak, it follows that the antennary space directly beneath or adjoining the narrow frontal piece is exceedingly reduced in size, and the antennæ are minute. This is also true of the Oxystomes, in which the front is very narrow.

Milne Edwards, with his usual acumen, has also pointed out pecu-

liarities in the sternal plate and abdomen, which are of considerable weight. While, in a large part of the species, the male abdomen is as broad behind as the sternum, there are others in which it is much narrower behind. The sternum may be narrow behind, with an abdomen equally narrow at base—broad with an abdomen narrow at base—broad with an abdomen broad at base; and these differences are of much use in certain divisions of the species.

From this review of the relative value of the distinctions among the Brachyura, we may pass to the use of these differences in classification. And, in the first place, we would express our high estimate of the vast labour and profound researches in this department, of Edwards, the eminent Zoologist of France, and first Crustaceologist of the age. And if we venture to differ from him in any point, it is with the consciousness of having been helped forward to our starting-point by the results of his investigations. And as science with the world, and least of all with him, is not at a stand-still, we may believe that his own labours, if recently bestowed on the subject, would have evolved many improvements, the long period of near twenty years having elapsed since his system was published.

We cannot omit to mention, also, the benefit derived from the magnificent work of De Haan. We have admired the wonderful fidelity of his plates, the thorough spirit of investigation displayed throughout his princely volume, and the judgment with which he has seized upon typical forms in instituting genera. We have observed the large addition of facts developed by his investigations, and the new light thrown upon the relations of many groups. Yet we shall have to object to a defective system of arrangement and description, especially as relates to the Brachyura, by which his types are often thrown into wrong associations, and the groups they typify are laid down with false limits.

Among the distinctions pointed out in the foregoing review, we place first those dependent on the branchial system. The characters based on the opening of the efferent channel are fundamental in themselves, and the species of the two groups thus indicated, have wider differences than any that may be found among the species in either group. The Leucosoidea are thus strikingly distinct from all other Brachyura.

But we exclude from this division, as done by De Haan, the *Corys-*  
*toid* species, placed in the group by Edwards; for these are Cancroid



in the efferent channel and branchial peculiarities, as well as in many other particulars, although some species have the buccal area a little narrower anteriorly than behind.

The *number* of branchiæ is less distinctive, as already explained.

The characters next highest in value, are those of the genital system, especially the position of the male appendages.

To a certain extent the general form is of great importance, inasmuch as the form is an indication of the position of the internal parts of species, and preeminently of the greater or less concentration of the organs of the senses. We perceive at once the wide distance between the Maiioidea,—in which the anterior, across the medial or stomach region is narrow, with the front narrow and prolonged, and the great bulk of the body is posterior to its middle,—and the Cancer or Grapsus, which forms have the body as broad before as behind, and no rostral elongation in front. The character of the epistome, and the relation of the outer antennæ to the eyes, are dependent on the form.

Of considerable weight may be the characters afforded by the *outer maxillipeds* and *outer antennæ*—the articulation of the third and fourth segments of the outer maxillipeds, whether at the inner apex of the former or remote from this apex—the size of the outer antennæ, whether small, naked, and flexed outward, or large, hairy, or flexed inward. The maxillipeds thus separate the MAIOIDEA and CANCROIDEA from the GRAPSOIDEA; and the outer antennæ remove the CORYSTOIDEA from the other groups, allying them at the same time to the Hippidea.

We thus arrive at the grand divisions instituted by Milne Edwards, with the exception of the separation of the Corystoidea from the Leucosoidea, of which we propose to make a separate group. In the Maia and Leucosia groups we agree nearly with De Haan, but not in the other groups.

The five subtribes into which the Brachyura are distributed, are characterized as follows:—

#### I. CRUSTACEA MAIOIDEA.

I. Via efferens partes palati laterales trajiciens; area buccalis subquadrata.

II. Pyramis branchialis novem branchiis instructus, septem branchiis superficiem pyramidis constituentibus.

III. Appendices maris genitales basi pedum 5torum ortæ, abdomine semper celatæ.

IV. Articulus maxillipedis externi 3tius, 4tum apice interno aut summo sistens.

V. Carapax sæpissimè oblongus, antice augustus et sæpe subacuminatus aut rostratus. Epistoma sæpius grande. Antennæ internæ longitudinales. [Sæpius antennarum articulus 1mus externarum sub oculo insitus et antice productus.]

VI. Flagellum antennarum externarum parvulum nudum vel nudiusculum, extrorsum plus minusve flexum.

## II. CRUSTACEA CANCROIDEA.

Discrimina I., II., III., IV., VI., ut in Maiioideis.

V. Carapax sæpissimè transversus (interdum quadratus vel orbicularis), antice latus, arcuatus, nec rostratus, nec acuminatus. Epistoma breve. Antennæ internæ sæpissime transversæ. Antennarum articulus 1mus externarum infra oculum insitus, antice non productus, suturâ disjunctus.

## III. CRUSTACEA CORYSTOIDEA.

Discrimina I., II., III., IV., ut in Maiioideis.

V. Carapax paulo transversus, orbicularis vel oblongus, antice arcuatus, sæpissime triangulatè rostratus. Epistoma brevissimum. Antennæ internæ longitudinales.

VI. Antennarum externarum flagellum elongatum, sive ciliatum, sive paulo hirsutum, introrsum paulo flexum.

## IV. CRUSTACEA GRAPSOIDEA.

Discrimina I., VI., ut in Maiioideis.

II. Pyramis branchialis novem branchias raro habens, 4-6 oblongis superficiem pyramidis construentibus.

III. Appendices maris genitales sive sterno ortæ sive basi pedum posticorum, deinde canaliculo sterni jacentes.

IV. Articulus maxillipedis externi 3tius 4tum apice externo margineve apicali sistens.

V. Carapax antice latus, sæpe subquadratus, interdum subglobosus,



antice transversus vel arcuatus, nunquam rostratus. Epistoma brevissimum.

#### V. CRUSTACEA LEUCOSOIDEA.

I. Via efferens medium palati trajiciens; area buccalis plus minusve triangulata.

II. Pyramis branchialis 7-9 branchiis instructus.

Discrimina III., VI., ut in Maioides.

V. Carapax sive transversus sive subglobosus. Frons angustissimus. Epistoma nullum. Antennæ minutæ.

The Maioides pass into the Cancroidea through the Parthenope group, the species of which are mostly *transverse* in form, with a *short epistome*, and have the first joint of the outer antennæ situated *more inward* than the eyes, and *rarely produced beyond them*, besides being either free or bounded commonly by a distinct suture on the outer side, and occupying a hiatus in the orbital margin,—in all of which points they differ from the Maia type.

The Cancroidea pass into the Corystoidea through the genus Cancer (Leach), and Pirimela, which have the outer maxillipeds projecting somewhat over the epistome. Pirimela has also the narrow form of the Corystoidea. But neither genus has the outer antennæ of Corystes. There is also a passage into the Anomoura through Acanthocyclus, in which the form is circular, the outer antennæ obsolete, and the branchiæ less than the normal number; the line through Acanthocyclus leads to Corystoides and Bellia, genera of inferior grade, approaching the Macroura in having no fossettes for the inner antennæ, although Brachyural in form.

The Cancroidea and Grapsoidea are united, through Eriphia and Telphusa on one side, and the Gonoplax group on the other. Telphusa, although Grapsoid in form, has the same number of branchiæ as in the Cancroidea, a similar abdomen, and a like position for the male appendages, and belongs properly therefore with the Cancer group. In Gonoplax and some allied genera, the outer maxillipeds are Cancroid in character, and unlike the other Grapsoidea, the male verges are, in some cases, inserted in the basal joints of the two posterior legs, instead of the sternum; yet they are conducted in a channel in the sternum and so pass beneath the abdomen instead of being covered by the abdomen from their insertion, as in Telphusa and the true Cancroids.

We close these remarks on the Brachyura with some observations on the classification of De Haan. The exalted merit of his labours seems to forbid criticism on a matter of arrangement. Yet classification is of the highest importance; since it should exhibit the progress and condition of the science, and present in a single view its general truths. The defects in his system have arisen from a wrong principle, as we think, in its very foundation; and the results of the principle are seen, not only in many of the larger divisions, but also in laying down his genera. The objectionable point referred to, is his giving paramount importance in classification to the maxillipeds,—the true value of which has been already explained. In the Leucosoidea they have a strongly characteristic form, and this group is readily characterized by reference to them. Yet even in this they may be treated with undue importance. The true distinction of the Leucosoidea is exhibited not in the inner maxillipeds, but in the character of the efferent branchial channel: the peculiarity in this important function is the fundamental difference separating these from other Brachyura. The elongate form of the inner branch of the first maxillipeds is rather an indication of the difference, than correctly the great point of difference.

The grand divisions of the Brachyura in De Haan's system are as follows:—A. BRACHYGNATHA, including I. Cancroidea; II. Maiacea; III. Dromiacea; IV. Trichidea: B. OXYSTOMATA, including I. Dorippidea; II. Calappidea; III. Matutoidea; IV. Leucosoidea: and the Cancroidea are subdivided into *Corystes*, *Cancer*, *Portunus*, *Ocypoda*, and *Grapsus* groups.

In the primary divisions, the Oxystomata (curtailed of the *Corystes* group, placed among them by Edwards, McLeay, and other authors) make a natural section among the Brachyura: they are the Leucosoidea of the system adopted. The character of the efferent channel affords a strongly-marked division. But in making out a natural classification, it is necessary to inquire whether there may not be other distinctions equally important; whether, among those species that are alike in the efferent channel, there may not be points of difference fully as essential, thus requiring the institution of other groups of like importance with that of the Leucosoidea. The arrangement which has been proposed contains our views on this point. The *Maia*, *Cancer*, and *Grapsus* types, have each important characteristics, based upon points



of structure, not less fundamental, or of less functional value, than that distinguishing the *Leucosia* section.

In the first of the grand divisions of De Haan, the *Cancer* and *Grapsus* groups are embraced under the tribe *Cancroidea*, while the *Maia* group is a distinct tribe. Yet it is evident that the *Maia* and *Cancer* groups have even closer relations than the *Cancer* and *Grapsus* groups. The former are related in most of the prominent characters,—the branchial, buccal, abdominal, and genital; although so unlike in the narrow front, the more posterior position of the parts within, the antennæ and other points, as to authorize a separation of the two. While the *Grapsoid* species are remote from the *Canceroids*, not only in general form, but more essentially in the number of branchiæ, the insertion of the male sexual appendages, and the articulations of the outer maxillipeds, which here take a peculiar character, sustained through nearly all the group.

*Trichidea* includes the single genus *Trichia*—in form near a slightly transverse *Mithrax* or a *Parthenope*; in number of branchiæ, male appendages, and abdomen, like the *Maiioidea* and *Cancroidea*; in the first basal joint of the outer antennæ being situated in a hiatus of the orbit, not projecting beyond it, bounded by a suture outside, and in the character of the orbit, like *Parthenope* and most *Cancroidea*, and unlike the *Maiinea*; in the longitudinal inner antennæ like *Parthenope* and other *Maiioidea*. In all its essential characters, it is related to *Parthenope*. The form of the maxillipeds is near the same in *Dromia*, which genus has also similar antennæ. But *Dromia* is also related to *Parthenope*; yet, unlike *Trichia*, it is a degraded form, verging towards the *Macroura*, as has been explained.

The *Dromiacea* are evidently intermediate between the *Brachyura* and *Macroura* in the characters alluded to; and although nearer the former than the latter, they are best retained in the tribe *Anomoura*. No species but these transition forms have the number of branchiæ larger than the normal number, or the vulvæ in the base of the third pair of legs. De Haan has transferred to *Dromiacea*, the genus *Latreillia*. He has greatly increased our knowledge of these species, showing that they have the posterior legs of a *Dromia*, and the same position to the vulvæ; moreover, they were known to have no fossettes for the inner antennæ, and the outer antennæ free and moveable to the base. These are all characters of the *Anomoura*; and there is but one essential point in which they are different,—

in the number of branchiæ being but *nine*, as in the *Maiinea*. The position of the genus between *Dromia*, and the long-legged *Maiinea* is evident, but its closest relations are with the former, as shown by De Haan. The genus *Oncinopus* is, in our view, a genus on the same line of transition, between *Latreillia* and the *Maiinea*, but belongs with the latter.

Such objections we are disposed to offer to the higher divisions in the system of De Haan. It is in the lower subdivisions that the maxillipeds are relied upon, to the exclusion, mostly, of more important characteristics.

In the subdivisions of the Canceroidea, the groups *Cancer*, *Corystes*, *Grapsus*, *Ocypoda*, and *Portunus* (called by De Haan genera), are characterized by reference to the first and third maxillipeds. The insertion of the fourth joint of the outer maxillipeds remote from the inner apex of the third, separates *Ocypoda* and *Grapsus* from the rest.

In his synoptical table of genera of the Canceroidea, *Corystes* and *Cancer* differ in the former having the third joint of the outer maxillipeds *oblong-quadrate* or *elongate*, and the latter *quadrate* or *transverse*. Yet in half the genera of the *Corystes* group, the form of this joint is not oblong, and in some genera of the *Cancer* group it may be elongate. In the genus *Cancer*, this joint is usually oblong, and it often overlaps somewhat the epistome, as in many *Corystidea*. Even in the genus *Xantho*, in which this joint is usually transverse or quadrate, it is sometimes much elongate, as is seen in *X. Orbignii* (Edw. and L.), in which it resembles what is seen in some *Corystes*, though not expanded over the epistome. When we consider that these outer maxillipeds are only modified legs, we feel at once the fact that such variations are of small moment,—nothing in fact, but the more or less extension of a margin; only the connexion of such a variation with the necessities of some vital function in the animal, could give it a wide value in classification.

The group *Portunus* is naturally distinguished by their having a peculiar lobe to the inner margin of the interior branch of the first maxillipeds. The detection of this important character is due to De Haan. *Platyonychus* and *Carcinus* are thus excluded from the group, and on account of the character of the outer maxillipeds, De Haan places these genera in his group *Corystes*, to the species of which they bear some resemblance in form. In our view, these and the allied genera more properly constitute a distinct family, near the *Portunus* group. The large outer antennæ of the *Corystes* group, flexed



inward at base, are so peculiar, and so evident an exhibition of a relation to the Hippidea, that we naturally give it a prominent place among the characteristics of the Corystoid Crustacea. We have remarked in a former paragraph upon its being a mark of degradation. We should, hence, exclude *Platyonychus*, and the allied, from direct association with *Corystes*, notwithstanding the similarity in the outer maxillipeds. Indeed, in all their characters they are so closely like many Cancroid species, that we find no means of distinction. If then they are Cancroid in character, and not Corystoid, they must be arranged, either in the *Portunus* group as a separate subdivision of it, or they should form a distinct division among the Cancroidea. We incline to make them a distinct division near the *Portunidæ*. The genus *Pirimela* is placed by De Haan in the *Corystes* group, for the same reason as *Platyonychus*, although essentially Cancroid in character. The genus *Cancer* has almost equal title to a place there, and on like grounds.

The importance allowed to the outer maxillipeds has led to other unnatural associations among his Cancroidea. The *Cancer* group contains species that have the general habit, branchiæ, and other characters of the *Grapsidæ*. I refer to the *Gonoplax* family, which is rightly placed with the *Grapsus* group by Edwards. They have the fourth joint of the outer maxillipeds articulated with the inner apex of the third joint, and this is the only character that would ally them with the *Cancer* division, rather than with *Grapsus*.

The distinction between *Ocypoda* and *Grapsus*, depending on whether the fourth joint of the outer maxillipeds is articulated with the summit, or with the outer apex of the third joint, is exceedingly difficult of application, and does not in all cases, lead to natural associations. *Cardisoma* and *Uca* are arranged by De Haan in the *Ocypod* group, and *Gecarcinus* in the *Grapsus* group.

The difficulties from relying so implicitly on the maxillipeds are still more strongly seen in the generic distinctions as given by De Haan. There are cases in which the distinctions are good; but they are used to such an extent as to be in the main bad. The genus *Xantho* is said to have the third joint of the outer maxillipeds subquadrate, a character which would exclude species in which it is oblong: and it embraces species that are not true *Xanthos*, if judged by the character of the antennæ, organs of higher importance than the maxillipeds. The genus *Eudora*, containing the *Rupellia tenax* of Edwards, is so characterized as to include a *Xantho*; that is, the character of the orbit of the *Rupellia*, which has no similar example except in the

related genus *Eriphia*, is disregarded, and species of different natural groups are brought together. It cannot be said on any ground that *Ruppellia* and *Eudora* are synonymes, and the latter name can be sustained only by sustaining also the system of De Haan. Again, the genera *Xantho*, *Liagore*, and *Galene* are described as having the inner branch of the first maxillipeds terminate in a short dilatate triangle. If we take *Xantho* with its typical species, and trace the genus through its range, we find it passing into narrower forms, of the same essential characters, (though referred by us to *Paraxanthus*,) in which this triangle is narrow-oblong instead of short-dilatate, and closely like that of *Pilumnus*, which is *narrow-trigonal*. Indeed, it is found that the form of this branch varies directly with the breadth of the species, and is equivalent in value, as a generic characteristic, to the breadth of the species, and of no value at all in itself. The same variations take place in Leach's *Chlorodius* as in *Xantho*. The character given for *Pilumnus* would, therefore, include true *Xanthos* or *Paraxanthi*, and also, true *Chlorodii*. Thus the true limits of groups are not defined, and perplexing ambiguities meet one at every step. Milne Edwards's system left the press the following year after the publication of De Haan's synopsis of genera; and it is obvious that no amount of study could have enabled him to comprehend all the genera of De Haan, so as not to have duplicated them in his own work. Such duplications actually took place, and if the names of either author are to be retained, science would most justly award the honour to him who characterized them so as to be recognised by others. Still, it should be remembered that the science is vastly indebted to De Haan for his researches. He has developed many important distinctions. It is of much interest to know, that while the broad Cancroidea have generally the inner branch of the first maxillipeds broad-triangular, the species of the genus *Cancer*, which are remarkable for their breadth, have the same branch narrow-triangular; for it shows a correspondence with the front and inner antennary areas, which are also narrow, the latter so much so, that the antennæ are *longitudinal*, while transverse in all other Cancroidea. The divergence of the genus *Cancer* from the other genera of Cancroidea, is thus rendered more apparent.

Among the Portunidæ, other discrepancies between species and the generic characters laid down in De Haan's system, may be briefly alluded to. *Amphitrite* is said to have the third joint of the outer maxillipeds *short and oblique*. This genus is a subdivision of *Lupa*,



corresponding nearly to Edwards's division "Lupées marcheuses." In one specimen in our collections, this joint is triangular and very slightly longer than its breadth at base; in another it is considerably oblong, with the summit truncate instead of obtusely pointed, and this summit is bent a little outward and upward. Both of these species have a long lateral spine, like that in *A. hastatoides* of De Haan, which they resemble, the same kind of teeth on the lateral margin, similar frontal teeth and eyes. Indeed, in every essential point they are congeneric. In another species (near *A. gladiator*, as figured by De Haan, pl. 18, f. 1), this third joint of the outer maxillipeds is still more oblong and concave on its surface, and is bent obliquely upward and outward over the summit of the palpus, so as to present its surface in this part to a front view, instead of its edge;—this peculiarity is but a farther development beyond that in the second of these three species alluded to. (See figures of these species, Plate 17.) Such are the wide variations in the outer maxillipeds in species which give no other grounds for generic distinctions.

Again, De Haan makes Neptunus and Achelous differ from Amphitrite in having the third joint of the outer maxillipeds more oblong, the reverse of which is actually the fact among many of the species examined by us. So, in Thalamita, this same joint is described as short, when, in fact, it is sometimes longer than broad. The form in *Thalamita integra* scarcely differs in relative length or in obliquity from that of *Lupa dicantha*. Again, Oceanus (*Thalamita crucifera* of authors), is said to have the inner branch of the first maxillipeds trilobate; and Thalamita is described as having the same margin unidentate. The latter has the *inner* lobe as in Oceanus; but the outer is straight at top (as in *Th. admetus*), or concave in outline (as in *Th. crassimana* and *crenata*), and this concavity is so deep and angulate in *Thalamita integra* that it approaches nearly the bilobate character of Oceanus, although the *integra* is otherwise very near the *admetus*. It seems evident, therefore, that too much importance is allowed to small variations in these organs—the shape of the triangle—its upper margin straight or sinuous, and the like; for such characters are of little value unless as indications or accompaniments of other peculiarities.

As an example of species having such accompanying characteristics, we have, in a preceding paragraph, alluded to the genus Cancer. *Eriphia* affords another example; the form of the maxilliped branch is

here narrow, because of the ridge on the prælabial plate. The absence of this ridge in *Lupa cribraria* while it is present in all other known *Lupas*, is attended by the opposite character, a great breadth to the inner branch, it reaching quite to the medial line. This last is a characteristic of real value, showing a generic distinction between *Lupa cribraria* and its supposed congeners. But we fail to find any good reason for putting the *L. dicantha* and *L. cribraria* into one genus, separate from *L. sanguinolenta*, as done by De Haan.

We are, therefore, fully sustained in pronouncing De Haan's genera as often either incorrect or ambiguous in their limits. We might pursue the subject farther; but these illustrations appear to be sufficient. The errors have arisen from assuming unimportant organs as a source of distinctions, and deriving the characters from the study of too few forms under each genus. The objections here brought forward do not affect the value of his facts as detailed, or his illustrations. Too exalted honours can scarcely be bestowed upon De Haan for the extreme fidelity of both his descriptions and plates, and the laborious research which they exhibit.

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#### I. CRUSTACEA MAIOIDEA, OR OXYRHYNCHA.

IN the subdivisions of the Maiioidea, the comparative length of the legs has been assumed as an important characteristic, and on this ground, they have been divided into three groups:—1, those with their eight posterior legs very long; 2, those with all the legs of moderate length; 3, those with the anterior legs long—and these groups are designated by Edwards, respectively, *Macropodinea*, *Maiinea*, and *Parthenopinea*.

But many examples show the little importance of the comparative length of the posterior legs, a characteristic unsupported by any others in the species. There is a species of the Macropod genus *Eurypodius*, which but for its identity in other characters with this genus, would be arranged with the *Maiinea*, as the legs are no longer than in many species of that group. Again, the genera *Doclea* and *Libinia*, as they are now united by the genus *Libidoclea*, so shade into one another with regard to the length of the legs, that we cannot without violating the most obvious natural affinities, based on characters of real importance, separate them, placing part, as is done, with the



Macropodinea and part with the Maiinea. The three genera, in fact, form a natural group, as is at once obvious on slight inspection. A new genus, *Oregonia*, from the Oregon coast, is so closely related to *Eurypodius*, that but for the penult joint of the eight posterior legs they would form the same genus; yet the legs in *Oregonia* are not so long but the species under a different relationship might fall in with the Maiinea. This disposition to give high importance to the mere length of the legs was so strong in earlier authors, that on this ground mainly *Hymenosoma* was formerly united with the *Inachidæ*.

It seems obvious, therefore, that in this threefold subdivision of the Maiioidea, too much stress is laid on a mere variation of length in a single set of organs. This is especially true of the first two groups. The third is a more natural association of genera, and is borne out by other characters. There is a like objection to the basis on which De Haan has separated the *Inachus* group (in which Edwards's *Macropodinea* are included, excepting *Latreillia* and *Doclea*). His distinction rests on the third joint of the outer maxillipeds,—a part liable to important variations even in the same genus; the *Inachus* group having this joint articulated with the fourth by its summit, and the other Maiioidea, by the inner apex. But while *Eurypodius* exemplifies the former, *Oregonia* is an instance of the latter, and thus his character divides widely these related genera. In fact, *Eurypodius* is not essentially different in this respect from *Oregonia*. The articulation takes place with the same part normally in both, and this is true in other genera of the *Inachus* group.

The Maiinea and *Macropodinea*, therefore, properly form but a single group. The genus *Latreillia*, however, is excluded, as done by De Haan; its outer antennæ being moveable and cylindrical to their base, its inner antennæ without fossettes, its vulvæ in the base of the third pair of legs, and the dorsal position of its hind legs, show a close relation to *Dromia* and *Dynomene*. *Oncinopus* has similar outer antennæ, and prehensile legs behind, but these legs are not dorsal, and the vulvæ are in their normal position. This genus forms a group by itself, distinct from the true Maiinea.

The grand divisions of the Maiioidea, are therefore, as follows:—

Legio I. MAINEA. — Corpus sæpissimè oblongum, sæpius anticè augustum et rostratum. Articulus antennarum externarum 1mus sub oculo insitus, anteriusque productus, testâ externâ sine suturâ coalescens. Pedes fornâ normales.

Legio II. PARTHENOPINEA.—Corpus sive breviter triangulatum sive valde transversum et antice arcuatum. Articulus antennarum exter-  
narum Imus oculo interior, rarissime solutus sæpius suturâ infixus,  
raro sine suturâ externâ coalescens. Pedes antici longiores, toti formâ  
normales.

Legio III. ONCININEA.—Corpus triangulatum. Antennæ externæ  
e basi solutæ, cylindricæ. Pedes postici breviores, subdorsales, unci-  
nato-prehensiles.

The Oncininea form a transition to Dromia, and the Parthenopinea  
to Corystes and Cancer.

## I. CRUSTACEA MAINEA.

IN arranging the Maiinea according to their natural families, we  
are guided mainly by the characters presented by the orbits or eyes.

In a large number of species, the eyes are retractile into proper  
orbits; in others, they may be thrown back, or are retractile in fact,  
but there is no orbit to receive them, and they are either exposed  
when retracted, or are concealed beneath the carapax; in others, the  
eyes admit of no retraction. The following are the families or groups  
to which we are led:

Fam. I. MAIIDÆ.—Oculi in orbitis retractiles.

Fam. II. TYCHIDÆ.—Oculi retractiles sed orbitis carentes, infra  
carapacem sese latentes.

Fam. III. EURYPODIDÆ.—Oculi ad carapacis latus retractiles, sese  
non latentes.

Fam. IV. LEPTOPODIDÆ.—Oculi non retractiles. Pedes prælongi.

Fam. V. PERICERIDÆ.—Oculi non retractiles. Pedes longitudine  
mediocres.

In farther subdivisions, the position of the external antennæ—the  
characters of the eyes—in some cases, the characters of the beak—the  
form of the fingers, whether excavate spoon-like or not—and the  
greater or less length of the eight posterior feet, afford proper means  
of distinction. The above families may thus be subdivided into sub-  
families. In the following synopsis of the known genera of Maiidea,  
we present these subdivisions and also the characters of the genera.



## FAM. I. MAIIDÆ.

## I. DIGITI ACUMINATI.

*A. carapax oblongus.*

## a. OCULI PLUS MINUSVE TRANSVERSIM PORRECTI.

## a. ANTENNÆ EXTERNÆ APERTÆ.

\* *Rostrum sive elongatum sive breve, porrectum, non tumidum.*

† Pedes 8 postici prælongi.

1. INACHINÆ. — Carapax triangulato-ovatus. Rostrum emarginatum aut integrum.

G. 1. INACHUS, *Fabricius*.—Carapax gibbosus, spinâ præorbitali sive parvulâ sive nullâ, rostro brevi. Pedes 8 postici filiformes, 2dis 3–4-plo longioribus quam carapacis pars post-rostralis.

G. 2. EGERIA, *Latreille*.—Carapax gibbosus, orbiculato-ovatus, rostro sat brevi, paulo reflexo. Pedes 8 postici filiformes longissimi (iis *Inachi* duplo longiores).

G. 3. MICRORHYNCHUS, *Bell*.\*—Carapax gibbosus, latitudine transorbitali parvâ, dente præorbitali nullo, post-orbitali parvulo. Rostrum parvulum, integrum. Pedes 8 postici corpore fere duplo longiores.

G. 4. CHIONÆCETES, *Kroyer*.†—Carapax vix longior quam latior, subtriangularis, antice truncatus, rostratus, rostro bifido, brevissimo. Pedes 2di carapace plus duplo longiores, 2di, 3tii, 4tique compressi.

2. MACROCHEIRINÆ. — Carapax latè ovatus. Rostrum furcatum. Pedes prælongi. Articulus antennarum externarum 1mus solutus.

G. MACROCHEIRA, *De Haan*.‡—Carapax gibbosus, orbiculato-ovatus, spinâ præorbitali parvulâ, rostro saliente, cornubus valde divaricatis. Pedes toti validi, longi.

†† Pedes 8 postici longitudine mediocres.

‡ *Pars antennarum externarum mobilis margine orbitæ orta.*

3. MAIINÆ. — Carapax orbiculato-ovatus, rostro prominente, profundè bifido.

G. MAIA, *Lamarck*.—Articulus antennarum externarum 1mus spinis duabus longis

\* Zool. Trans., ii. 40.

† Tidsskrift, ii. 249. The species for which this genus was established is the *Cancer phalangium* of Fabricius, Faun. Groenl., n. 214, and *Cancer opilio* of the same author, in Det danske vid. Selsk. Skr. nye Saml., iii. 180, sequ. cum tabula.

‡ Crust. Fauna. Japonica, 88.

apice externo armatus. Spina inter-antennalis elongata, acuta. Tarsus infra non spinulosus.

‡‡ *Pars antennarum externarum mobilis orbitâ omnino exclusa.*

4. PISINÆ.—Carapax triangulato-ovatus, rostro bifido.

1. Pedes 8 postici non valde compressi; articulus 5tus processu infra non armatus.
- G. 1. PARAMITHRAX, *Edwards*.—Carapax gibbosus, rostro elongato. Oculi graciles. Articulus antennarum externarum 1mus spinis duabus longis apice externo armatus (coque *Maixæ* affinis).
- G. 2. PISA, *Leach*. — Carapax elongatè pyriformis, gibbosus, spinâ præorbitali saliente, rostro longo, vix depresso. Articulus antennarum externarum 1mus angustus. Pedes 2di 3tiis valde longiores.
- G. 3. PELIA, *Bell*.\*—Carapax elongatè pyriformis, gibbosus, spinis præorbitali et post-orbitali carens, rostro longo, vix depresso. Articulus antennarum externarum 1mus angustus. Pedes 1mi 2dis breviores.
- G. 4. LISSA, *Leach*.—*Pisæ* affinis. Carapax pyriformis, rostro longiusculo, cornubus laminatis, truncatis, dente præorbitali saliente.
- G. 5. RHODIA, *Bell*.† — Carapax pyriformis, paulo depressus, spinâ præorbitali saliente, rostro brevi, acuto. Articulus antennarum externarum 1mus angustus, apice acutè productus, extus unidentatus. Pedes 1mi 2dis breviores.
- G. 6. HYAS, *Leach*.—Carapax ovatus, sæpe lyratus, depressus, spinâ præorbitali carens, rostro longiusculo, acuto, depresso. Articulus antennarum externarum 1mus angustus, 2dus depressus. Tarsus infra non spinulosus.
- G. 7. PISOIDES, *Edw. et Lucas*.‡—*Hyadi* affinis. Carapax latè ovatus, spinâ præorbitali carens, postorbitali parvâ, rostro longiusculo, acuto. Articulus antennarum externarum 1mus latissimus, 2dus depressus, densè eiliatus.
- G. 8. HERBSTIA, *Edwards*.—Carapax orbiculato-ovatus, depressus, spinâ parvâ præorbitali instructus, rostro brevi, cornubus paulo depressis, acutis. Articulus antennarum externarum 1mus angustus, apice acutè productus, extus unidentatus. Pedes 1mi 2dis longiores.

2. Pedes 8 postici late compressi.

- G. 10. THOE, *Bell*.§—Carapax late ovatus, rostro parvulo, bifido, dente præorbitali saliente. Oculi breves. Articulus antennarum externarum 1mus latissimus. Pedes 1mi *maris* 2dis longiores.

3. Articulus pedum posticorum 5tus processu infra armatus.

- G. 11. DEHAANTUS, *M'Leay*.||—*Hyadi* paulo affinis. Carapax latus, spinâ præorbitali saliente, rostro sat brevi. *Leucippæ* affinis, si oculi non retractiles.

\*\* *Rostrum saliens, porrectum, tumidum, apice emarginatum.*

5. LIBININÆ.—Carapax latè pyriformis, tumidus, lateribus altis. Oculi perbreves. Pedes sive mediocres sive prælongi.

\* Zool. Trans., ii. 35.

† Zool. Trans., ii. 43.

‡ Crust. D'Orbigny's South America, 10, pl. 5.

§ Zool. Trans., ii. 47.

|| M'Leay, Smith's Illust. Zool. S. Africa.



- G. 1. LIBINIA, *Leach*.—Pedes mediocres. Carapax dente præorbitali parvulo instructus. Abdomen *maris feminæque* 7-articulatum. Articulus antennarum externarum Imus latiusculus, extus non dentigerus.
- G. 2. LIBIDOCLEA, *Edw. et Lucas*.\*—Pedes longi. Carapax spinis plus minusve armatus, dente præorbitali parvo. Articulus antennarum externarum Imus angustus, apice acutè productus, extus dentigerus.
- G. 3. DOCLEA, *Leach*.—Pedes prælongi. Carapax spinis plus minusve armatus, dente præorbitali carens. Articulus antennarum externarum Imus angustus. Abdomen *maris* 7-articulatum, *feminæ* 5-7-articulatum.

\*\*\* *Rostrum breve, latissimum, bilobatum, porrectum.*

6. PRIONORHYNCHINÆ. — Carapax ovatus, gibbosus. Oculi breves. Fossæ antennales marginem frontalem fere attingentes.

G. PRIONORHYNCHUS, *Holmbron et Jacquinot*.†

\*\*\*\* *Rostrum latum valde deflexum.*

7. MICIPPINÆ.—

G. MICIPPA, *Leach*.—Oculi longiusculi. Carapax anticè parce angustior, rostro laminato.

β. ANTENNÆ EXTERNÆ SUB ROSTRO CELATÆ.

8. CHORININÆ.—Carapax triangulato-ovatus. Rostrum furcatum. Pedes 8 postici vix compressi.

- G. 1. CHORINUS, *Leach*.—Carapax gibbosus, spinis plus minusve armatus, rostro longo, eornubus acuminatis, spinâ præorbitali saliente. Margo orbitalis inferior largè interruptus. Articulus antennarum externarum Imus angustus. Pedes 2di 3tiis valde longiores.
- G. 2. CHORILIA, *Dana*.—Carapax formâ rostroque *Chorino* affinis. Orbita infra latè interrupta, supra fissa, spinâ præorbitali acutâ. Articulus antennæ externæ Imus angustus, apice externo acutè productus. Pedes 1mi 2dis breviores, 8 postici similes, 2di 3tiis non multo longiores.
- G. 3. LAHAINA, *Dana*.—Carapax formâ rostroque *Chorino* plerumque affinis. Cornua rostri gracillima valde divaricata. Articulus antennæ externæ Imus latus, parce longior quam latior, apice eum processu spiniformi armato. Orbita infra supraque sinu rotundato interrupta, dente præorbitali acuto. Pedes toti graciles.
- G. 4. NAXIA, *Edwards*.—Carapax gibbosus, rostro medioeri, eornubus subeylindricis, truncatis, dente præorbitali brevi. Margo orbitalis inferior fissus, non late interruptus. Articulus antennarum externarum Imus latus, apice angustus.
- G. 5. SCYRA, *Dana*.—Carapax gibbosus, rostro medioeri, laminato, eornubus acutis, dente præorbitali acuto. Margo orbitalis superior paulo uniffissus. Articulus antennarum externarum Imus omnino angustus, 2dus depressus.

\* Crust. D'Orbigny's South America, 6, pl. 3.

† Voy. Astrolabe et Zélé au pôle Sud, pl. 1, f. 1.

G. 6. HYASTENUS, *White*.\*—*Chorino* affinis. Rostrum prælongum, cornubus non depressis, ante poneque oculos directus. Margo orbitalis superior unifissus. Pedes 2di longiores.

9. PYRINÆ.—Carapax subpyriformis. Pedes 8 postici valde compressi.

G. 1. PYRIA, *Dana*.—Carapax depressus, incermis, rostro lamellato, cornubus ovatis. Oculi perbreves, orbitâ spinis non armatâ.

b. OCULI LONGITUDINALITER PORRECTI, CARAPACE ANTICE TRUNCATO.

10. OTHONINÆ.—Carapax antice late truncatus, rostro fere obsoleto. Oculi elongati, cylindrici.

G. OTHONIA, *Bell*.†—Carapax parce oblongus, suborbicularis, rostro bifido. Antennæ internæ minutissimæ; externæ latæ, articulo 1mo lato, 2do valde depresso, inverso-subtriangulato.

*B. Carapax paulo transversus.*

11. SALACINÆ.—Carapax fere orbicularis. Pedes 8 postici crassi, longi, articulo penultimo infra recto. Rostrum fere obsoletum, integrum.

G. SALACIA, *Edwards et Lucas*.‡—Carapax gibbosus. Fossa antennalis sub rostro partim excavata. Articulus maxillipedis externi 3tius medio apice emarginatus, hæcque emarginatione articulum proximum gerens. *Inacho Grapsoque* affinis.

2. DIGITI APICE OBTUSI, INSTAR COCHLEARIS EXCAVATI.

12. MITHRACINÆ.—Oculi mediocres. Carapax sive paulo oblongus, sive transversus.

G. 1. MITHRAX, *Leach*.§—Carapax sæpe orbiculato-ovatus, interdum transversus. Rostrum aut saliens aut fere obsoletum, bifidum. Articulus antennarum externarum 1mus apice externo duabus spinis longis armatus.

\* Ann. Mag. Nat. Hist. [2], xx. 61, and Crust. Voy. of Samarang, p. 11. The species in Seba's fig. 12, pl. 18 of the Thesaurus.

† Zool. Trans., ii. 55.

‡ Crust. in D'Orbigny's S. Amer., 12, pl. 11.

§ The characters given by White for his genus *Schizophrys* (Ann. Mag. N. H. [2], ii. 282, 283, and Voy. Samarang, Crust., p. 16), do not serve to exclude the species from Paramithrax, Maia or Mithrax. The peculiarity of the orbit described and of the first joint of the outer antennæ, as far as understood by the writer from the description, are the same as in the genera just mentioned.

The genus *Dione* of De Haan (Fauna Japon. Crust., p. 82) differs from Mithrax only in not having the interior apex of the third joint of the outer maxillipeds project inward a little over the insertion of the fourth joint. It corresponds to "*Mithrax triangulaires*" of Edwards.



- G. 2. MITHRACULUS, *White*.—Carapax transversus. Articulus antennarum externarum Imus duabus spinis longis non armatus.
13. CYCLACINÆ.—Oculi longi.
- G. CYCLAX, *Dana*.—Carapax paulo oblongus, orbiculato-ellipticus, rostro sat brevi, bifido, acuto. Pedes 8 postici longi.

## FAM. II. TYCHIDÆ.

1. CRIOCARCININÆ.—Rostrum valde deflexum. Carapax oblongus.
- G. CRIOCARCINUS, *Guerin*.—Oculi prælongi, orbitæ margo superior processu longo lamellato apicem armato instructus.
2. TYCHINÆ.—Carapax oblongus, anticè latus, latitudine trans-orbitali grandi, rostro non deflexo, sat longo, furcato. Oculi apice paululum exserti.
- G. TYCHE, *Bell*.—Carapax depressus, antice cornubus rostri spinisque duabus præorbitalibus totis parallelis et subæquis confectus, spinâ post-orbitali nullâ. Articulus antennarum externarum Imus oblongus, inermis.
3. CAMPOSCINÆ.—Carapax oblongus, rostro fere obsoleto, emarginato. Pedes 8 postici longi. Oculi longè pedunculati et exserti.
- G. CAMPOSCIA, *Latreille*.—Carapax subpyriformis, non armatus. Pedes 8 postici subcylindrici, 2di 3tiis breviores.\*

## FAM. III. EURYPODIDÆ.

1. *Antennæ externæ apertæ.*

1. EURYPODINÆ.—Carapax triangulato-ovatus, rostro longo, furcato. Pedes longi, 4 postici non bene prehensiles. Oculi longi et longe salientes. Spina post-orbitalis oblonga.
- G. EURYPODIUS, *Guerin*.—Pedes 8 postici longi, articulo penultimo valde compresso, ensiformi.
- G. OREGONIA, *Dana*.—Pedes 8 postici sat longi, articulo penultimo subcylindrico.

2. *Antennæ externæ sub rostro celatæ.*

2. AMATHINÆ.—[An oculi retractiles, iis *Eurypodii* similes, eoque genus hac sede?] Carapax triangulato-ovatus, rostro furcato, latitudine trans-orbitali perangustâ. Pedes longi.

\* Zool. Trans., ii. 57.

G. AMATHIA, *Roux*.—Carapax gibbosus, valde armatus, rostro prælongo, cornubus divaricatis. Pedes filiformes, prælongi. Oculi parvi. Articulus antennarum externarum Imus perangustus. Epistoma fere quadratum.

## FAM. IV. LEPTOPODIDÆ.

A. *Antennæ externæ apertæ.*

1. ACHÆINÆ.—Carapax triangulato-ovatus, rostro perbrevis, bifido. Oculi longi longèque salientes. Pedes 4 postici subprehensiles.

G. 1. ACHÆUS, *Leach*.—Carapax gibbosus. Pedes 8 postici filiformes, longi, tarso pedum 4 posticorum falciformi, articulis penultimis subcylindricis.

2. INACHOIDINÆ.—Carapax triangulato-ovatus, rostro elongato, simplice.

G. INACHOIDES, *Edw. et Lucas*.—Carapax valde gibbosus, rostro longiusculo, acuto, spinâ post-orbitali parvâ. Pedes 8 postici sat longi, gracillimi. Articulus antennarum externarum Imus angustus.

B. *Antennæ externæ celatæ.*

3. LEPTOPODINÆ.—Carapax triangulato-ovatus, rostro elongato, simplice. Pedes longissimi.

G. LEPTOPODIA, *Leach*.—Oculi sat salientes. Pedes toti gracillimi.

4. STENORHYNCHINÆ.—Carapax triangulato-ovatus, rostro breve, bifido.

G. STENORHYNCHUS, *Lamarck*.—Oculi sat salientes. Pedes antici crassiusculi.

## FAM. V. PERICERIDÆ.

A. *Antennæ externæ apertæ.*

1. PARAMICIPPINÆ.—Rostrum valde deflexum. *Micippæ* aspectu similes.

G. PARAMICIPPA.—Rostrum latum. Articulus antennarum externarum 2dus breviter cordiformis. Epistoma perbreve.

2. PERICERINÆ.—Rostrum profundè bifidum, non deflexum.

G. 1. PERICERA, *Latreille*.—Carapax sæpe triangulatus, interdum orbiculato-ovatus, paucis spinis sæpius armatus, rostro divaricatè furcato. Articulus anten-

\* Crust. in D'Orbigny's S. Amer., 4, pl. 4.



narum externarum 1mus apice latus et spinâ armatus. Orbita tubulata, oculum strictè includens, margine superiore subtiliter unifisso.

G. 2. TIARINIA, *Dana*.—Carapax subpyriformis, tuberculis plerumque pustuliformibus sæpeque aggregatis ornatus, rostri cornubus gracilibus contiguis. Articulus antennarum externarum 1mus apice latus et inermis, angulo externo interdum saliente tantum.

G. 3. PERINIA, *Dana*.—Carapax orbiculato-ovatus, tuberculis paucis non acutis ornatus, rostri cornubus brevibus, discretis. Articulus antennarum externarum 1mus oblongus, apice non latior, angulo externo valde producto. Orbita antice aperta, margine superiore non unifisso.

G. 4. HALIMUS, *Latreille*.—Carapax triangulato-ovatus, cornubus rostri grandibus, divaricatis. Articulus antennarum externarum 1mus angustus. Articulus pedum 8 posteriorum 5tus valde compressus, processu infra non armatus.

G. 5. PUGETTIA, *Dana*.—Carapax triangulato-ovatus. Rostro antennisque externis *Halimo* affinis. Articulus pedum 8 posteriorum 5tus cylindricus.

### 3. MENÆTHINÆ.—Rostrum integrum aut subintegrum.

G. 1. MENÆTHIUS, *Edwards*.—Carapax triangulato-ovatus, depressus, regione antero-laterali plicis tribus plus minusve ornatâ. Pedes 8 postici cylindrici.\*

G. 2. ACANTHONYX, *Latr*.—Carapax depressus, non tuberculatus, sive subtriangulatus, sive subquadratus (dente post-orbitali dilatato), regionibus non conspicuis, dente præorbitali parvulo, rostro crasso, apice emarginato. Pedes 8 postici medioeres, articulo penultimo compresso, infra dilatato et sæpe dentigerus.

G. 3. ANTILIBINIA, *M'Leay*.†—Carapax valde convexus, regionibus non conspicuis, latitudine transorbitali minore (lat. max. 3plo latiore), rostro crasso, apice emarginato. Articulus pedum 8 posteriorum penultimus infra non dilatatus nec dentigerus.

G. 4. PELTINIA, *Dana*.—Carapax depressus vix tuberculatus, dente præorbitali breviter instructus, latitudine transorbitali majore (lat. max. 2plo latiore), rostro lato, profundè bifido, sat brevi. Articulus pedum 8 posteriorum penultimus infra non dilatatus nec dentigerus.

#### B. Antennæ externæ sub rostro celatæ.

##### 1. Oculi prælongi.

### 4. STENOCIONOPINÆ.—Rostrum longum, furcatum, cornubus styliformibus, divaricatis.

G. STENOCIONOPS, *Latreille*.—Carapax subpyriformis, gibbosus, spinâ præorbitali longissimâ. Articulus antennarum externarum oblongus.

\* The genus *Xiphus* of Eydoux and Souleyet, as figured in the plates of the Voyage of the Bonite, has the beak, præorbital spine or tooth, outer antennæ, and general form of Menæthius. But the eyes may be longer pedunculate, and as there is no description, it is not apparent whether they are retractile or not. The species is called *Xiphus margaritiferus*. The beak is pointed, and the third basal joint of the outer antennæ reaches to apex of beak.

† Smith's *Illust. S: Af. Zool.*

2. Oculi aut longitudine medioeres aut perbreves.

5. EPIALTINÆ.—Rostrum oblongum, crassum, sive integrum sive emarginatum. Antennæ externæ apicem rostri sæpius non attingentes. Pedes 8 postici subcylindrici.

G. 1. EPIALTUS, *Edw.*—Carapax inermis, vix tuberculatus, regionibus non conspicuis. Octo pedes postici nudi aut subnudi, articulo penultimo infra sæpe subdentigero.

G. 2. HUENIA, *De Haan.\**—Carapax 2–4 tuberculis acutiuseculis sæpius armatus, interdum inermis, regionibus inconspicuis, rostro simplice, angulo carapacis postero-laterali prominente. Articulus pedum 8 posticorum penultimus plerumque infra dilatatus, dentigerus.

G. 3. XENOCARCINUS, *White.†*—Carapax tuberculis subacutis sparsim armatus, rostro simplice, truncato, margine postero-laterali non angulato, rotundato.

G. 4. LEUCIPPA, *Edw.*—Carapax subtriangulatus fere inermis, regionibus non conspicuis, spinâ præorbitali nullâ. Pedes supra cariuati, articulo penultimo infra non producto. Dens postorbitalis prope oculum insitus, oculum vero non celante.

Genus ZEBRIDA, *White,‡* incertæ sedis; antennis externis obitâque *Eumedono* similis eoque Parthenopineis congruit.—Carapax depressus, non armatus, antice latior, dente post-orbitali portentose expanso, rostro latissimo, lamellato, profundè furcato. Oculi paululum salientes. Pedes compressi, angulati. Articulus antenarum externarum Imus *hiatum orbitæ occupans*, antice non productus.

## FAMILY I. MAIIDÆ.

### SUBFAMILY MAIINÆ.

#### MAIA SPINIGERA, *De Haan.*

East Indies.

*Maiia spinigera*, DE HAAN, Faun. Japon. 93, pl. 24, f. 4.

ADAMS and WHITE, Samarang, Crust. 15.

\* Crust. Fauu. Japon. 73.

† Jukes's Voy. H.M.S. Fly; Ann. Mag. N. H. [2], i. 331; Crust. Voy. Erebus and Terror, pl. 2, fig. 1.

‡ Crust. Voy. of Samarang, p. 23.



## SUBFAMILY PISINÆ.

## HYAS LYRATUS.

*Carapax*\* *lyratus*, parce minutè tuberculatus, pone oculos alatè expansus marginibus alæ antico posticoque subæquis, parallelis, margine externo excavato, rostro lævi, cornibus acutis, rectis. Pedes antici subtiliter pubescentes, brachio carpoque margines pustulatis, manu gracili. Pedes 8 postici longi, graciles, subtilissimè pubescentes.

Carapax lyrate, sparingly minute tuberculate, behind the eyes alately produced, anterior and posterior margins of the winged expansion nearly equal and parallel, external margin long and a little concave, the anterior angle acute, posterior subacute. Beak smooth, of moderate size, horns acute, straight. Anterior feet inconspicuously pubescent, arm and carpus with pustulate margin, hand thin. Eight posterior feet long, slender, very short pubescent.

Plate 1, fig. 1 *a*, male, natural size; *b*, under view of head, enlarged; *c*, abdomen, natural size; *d*, extremity of posterior pair of legs.

Puget's Sound, C. Pickering, U. S. Ship Vincennes.

Near the *Hyas coarctatus* in general form. The margin of the upper surface of the carapax posterior to the alate projection, is small tuberculate in a single series. The posterior margin has a small tubercle at middle. The medial region of the carapax is tumid and crossed by a series of small tubercles, and just behind these a tumid tubercle. The post-medial is prominent and has four or five small pustules at top, and either side there passes off obliquely backward across the postero-lateral region a line of small tubercles. The peduncle of the eyes has a small tubercle on the anterior side. The exterior maxillipeds are granulous or pustulous. The pterygostomial region has a transverse break in the osseous character of the surface, and is granulous, with the margin entire. Second pair of legs one and

\* The word carapax is not of Latin authority, yet it is so important to the science, that we need make no farther apology for introducing it into that tongue.

two-thirds the length of the carapax; posterior pair one and one-fourth times the same, and but little longer than first pair.

*Hyas lyratus*, DANA, Silliman's Am. J. Sci., 2d Ser., xi. 268.

PISOIDES EDWARDSII (*Bell*), *Dana*.

Plate 1, fig. 2 *a*, under view of head, much enlarged; *b*, outer maxilliped.

Valparaiso.

This species, as described by Bell and Milne Edwards, under different names, is short and thick hairy, and has a flattened pyriform shape. One specimen, a male, is sixteen lines long, and twelve lines greatest breadth, the beak four lines or one-fourth whole length. Another specimen nine lines long, had for its greatest breadth seven lines.

The beak is flattened, with the horns evenly and slightly divergent and setigerous within. The first joint of the outer antennæ is subquadrate nearly as in the Periceridæ, with the outer angle projecting as in *Tiarinia*. The second joint is full twice as long as the third, and both are flattened and ciliate on the outer side, the third being ciliate on both margins. The outer angle of the first joint is set with minute spinules or hairs, and a prominence at posterior angle is raggedly but minutely denticulate.

The exterior maxillipeds are pubescent, and the outer margin of the palpus has a re-entering angle a short distance from its upper extremity.

The legs have a fringe of rather short hairs on opposite (upper and lower) margins. The branchial regions are tumid, and there are two or three faint tubercles of small size. The cardiac region is a broad prominence with a rounded surface, and either side a little posteriorly there is a small tubercle. The stomach region is prominent with a low posterior tubercle, and another oblong one anteriorly equally distinct. Outer orbital acanthus acute. Intestinal region with a small tubercle, but all the tubercles concealed mostly by the villosity of the surface, so as not to be seen unless it is removed.



Inner edges of fingers of female denticulate throughout.

The genus *Pisoides* resembles *Hyas* in the flattened form of the moveable basal joints of outer antennæ, but the first basal joint is large quadrate and the epistome is very narrow.

*Hyas Edwardsii*, BELL, Trans. Zool. Soc. London, ii. 49, 1835, pl. 9, fig. 5.

*Pisoides tuberculatus*, M. EDWARDS, Crust. D'Orbigny's Voy. S. A., p. 11, pl. 5, fig. 1. This figure represents the animal without its villous coat, and hence differs from that by Bell.

#### SUBFAMILY LIBININÆ.

##### GENUS LIBIDOCLEA, *Edwards* and *Lucas*.

The genus *Libidoclea* was instituted by Milne Edwards and Lucas, in D'Orbigny's South America, Crustacés, p. 6. It has the general form, short beak and long legs of *Doclea*, but the inner angle of the orbit is prominent as in *Libinia*, which genus is similar also in form, though with much shorter legs. In the species described by Milne Edwards, the anterior margin of the third joint of the exterior maxillipeds is strongly notched, and this he lays down as a generic character. It fails, however, in our species, and cannot, therefore, be of this importance. The basal immoveable joint of the outer antennæ has a strong tooth on the outer side in both his species and ours; and in other characters of generic importance, the two appear to agree.

##### LIBIDOCLEA COCCINEA.

*Coccinea.* Carapax orbiculato-triangulatus, sparsim tuberculato-spinosus et paulo subtiliter granulatus, rostro sat brevi. Pedes subtilissimè granulati, tenues, digito paris 1mi subulato et basin non tumido, articulo paris 2di 3tio valde brevior quam carapax, tarsoque parè brevior quam articulus quintus, articulo 4to pedum 8 posticorum supra complanato et lævi. Articulus maxillipedis externi 3tius antice integer.

Scarlet. Carapax round triangular, sparsely tuberculato-spinous, and minutely sparse-granulous, beak shorter than in the *L. granaria*, feet finely granulous, slender; finger of first pair subulate, not tumid

at base; third joint of second pair much shorter than carapax, tarsus but slightly shorter than preceding joint; fourth joint of eight posterior feet flattened on upper side and smooth; third joint of outer maxillipeds anteriorly entire.

Plate 1, fig. 3 *a*, male, natural size; *b*, view of carapax from behind; *c*, under view, showing mouth and inner antennæ magnified two diameters; *d*, male abdomen, natural size.

Dredged up in thirty fathoms water, off the eastern coast of Patagonia.

Length, two and three-eighths inches; greatest breadth (excluding spines of sides), two and one-eighth inches; length of beak anterior to line of tips of orbital acanthi, three lines; distance between tips of orbital acanthi, five lines; length of second pair of legs, four and five-eighths inches; length of first pair, three and three-fourths inches.

This species differs from the figure of the *L. granaria* in the length of the beak and legs. The beak anterior to the orbital acanthi is much shorter than the distance between the acanthi, while the two distances are equal in the figure of the *granaria*; moreover, the distance from the tip of the third basal joint of the exterior antennæ to the tip of the beak is but little longer than this third joint, while it is more than twice this distance in the *granaria* as figured. The third joint of the second pair of legs is much longer than the carapax in the *granaria*, and much shorter in our species.

The carapax is covered with numerous spinous tubercles, the largest of which are the cardiac, and one postero-lateral on either side. Below and behind the last-mentioned spine there are several other prominent spines. On the median region there are three rows, as in the *granaria*, the inner containing three spines, and the outer two, with perhaps another, quite small, intermediate. There is a broad spinous tubercle on the antero-lateral region. The narrow space between the median region and the cardiac spine is depressed, being bordered with a curving ridge, convex inward, which is set with three or four small low spines.

The granules of the legs are half smaller than in the figure of the *granaria*. The outer angle of the basal joint of the outer antennæ is



prolonged and subacute. The pterygostomian region has its border strongly and irregularly dentate. The exterior maxillipeds have the anterior margin of the third joint entire and not notched, with the outline rounded.

*Libidoclea coccinea*, DANA, Silliman's Am. J. Sci., 2d Ser., xi. 268.

#### SUBFAMILY MICIPPINÆ.

##### MICIPPA HIRTIPES.

*Carapax minutè pustulatus, marginibus lateralibus irregulariter paulo inciso-dentatis; rostro fere verticali, sub-polygonato, juxta antennam externam profundè constricto, apice triangulatè emarginato, superficie seriatim pustulatâ, pustulis setigeris. Oculi longè exserti. Pedes hirsuti.*

Carapax minutely pustulate, wholly without spines, lateral margins irregularly small inciso-dentate; beak nearly vertical, sub-polygonate, adjoining outer antennæ deeply notched, and triangularly emarginate at apex, surface seriatly pustulate, and pustules setigerous. Eyes long exsert. Feet hirsute.

Plate 1, fig. 4 *a*, female, enlarged two diameters; *b*, front view of beak, enlarged four diameters; *c*, female abdomen; *d*, under view of head; *e*, hand of female.

Reef of the Island of Tongatabu, Pacific.

Length of carapax, seven lines; greatest breadth (across the cardiac region), six lines; post-orbital breadth, five and one-third lines; greatest breadth of beak, three lines.

The eyes project from a large rectangular emargination of the lateral margin, and the length of the eyes exposed in an upper view, is equal to nearly three times the diameter of the peduncle. Posterior to the eyes, there are four or five irregular teeth, and the rest of the margin is uneven. The surface of the beak, either side of the

medial line, is somewhat raised longitudinally, and bears minute tubercles, which give origin to tufts of setæ. The part of the front below the outer antennæ is broader than long, and the breadth by the second of the lateral angles is greatest. The female abdomen, excluding the first two joints, is orbicular and ciliate. The outer antennæ, as exposed in a front view, have the first of the two moveable basal joints oblong and stout and densely hirsute on either side, the second about half shorter and slender. The flagellum is five or seven jointed. Anterior legs slender; others stout and somewhat compressed. The hand is slender, tapering somewhat from the base, and the fingers are mostly contiguous, or touch only along outer half.

*Micippa hirtipes*, DANA, Silliman's Am. J. Sci., 2d Ser., xi. 268.

#### SUBFAMILY CHORININÆ.

##### GENUS CHORILIA, Dana.

Pisæ Chorinoque affinis. Carapax angustus, triangulatè ovatus, gibbosus, paulo armatus, rostro longo, furcato, cornubus gracilibus. Oculi in orbitis retractiles. Antennæ externæ sub rostro latentes, articulo primo angusto, apice externo acuto. Orbita infra interrupta, supra angustè unifissa, spinâ præorbitali acutâ. Pedes 1mi 2dis breviores, 8 postici similes, 2di 3tiis non multo longiores.

This genus differs from Pisa in having the outer antennæ concealed, and from Chorinus, in the second feet not being much longer than the third, and the first shorter than the second.

##### CHORILIA LONGIPES.

Carapax nec villosus nec pubescens, latitudine trans-orbitali perangustâ, triplo minore quam latitudo carapacis maxima, spinâ præorbitali tenui, acutâ, margine orbitali superiore angustè unifissa; rostro longo, pubescente, cornubus fere rectis, parce divaricatis; regione medianâ 4 spinis brevibus armatâ aliisque paucis brevissimis; regione cardiacâ parvâ, inermi, 2-4 tuberculis parvulis ornatâ; regione postero-laterali



*spinâ crassâ mediocri armatâ aliisque tuberculis parvulis ornatâ. Pedes antici longi, brachio trigono, margines spinuloso; carpo polygonato, margines spinuloso; manu subcarinatâ, subtilissimè tomentosâ.*

Not villous or pubescent. Trans-orbital breadth small, hardly one-third the greatest breadth of carapax; anterior orbital acanthus very slender, acute; superior orbital margin with a single small fissure. Beak long, pubescent, horns nearly straight and but slightly divergent. Median region of carapax armed with four short spines and a few others much smaller; cardiac region small, unarmed, but bearing two to four small tubercles; postero-lateral armed with a strong spine, not long, along with some small tubercles. Anterior feet long, arm trigonal, margins spinulous; carpus polygonal, margins spinulous; hand flattened, subcarinate, with a dense and very short tomentose coat.

Plate 1, fig. 5 *a*, female, natural size; *b*, under view of head, enlarged two diameters; *c*, side view, enlarged four diameters; *d*, abdomen of female.

Length of carapax, one inch and seven lines; greatest breadth, ten lines; trans-orbital breadth, three and one-third lines; length of beak, anterior to eyes, seven lines; length of anterior legs, one inch and six lines; length of third pair of legs, two inches; length of second pair, two inches and two and a half lines; length of posterior pair, one inch and eight lines.

The outer antennæ with the flagellum extend very nearly to apex of beak. There are a few short spinules at apex of peduncle of eye. The pterygostomial region is denticulate. The female abdomen consists of seven joints and is round-elliptical, the last joint the longest. The third joint of the outer maxillipeds is broader than long.

*Chorilia longipes*

*Chorilia longipes*, DANA, Silliman's Amer. Jour. Sci., 2d Ser., xi. 269.

#### GENUS LAHAINA, Dana.

*Choriliæ quoad pedes antennisque externas celatas affinis. Carapax elongatè ovatus, tumidus, parce armatus; rostri cornubus elongatis,*

*gracillimis, divaricatis. Articulus antennarum externarum Imus latus, parce longior quam lator, apicem processu spiniformi armatus. Orbita infra supraque sinu rotundato interrupta, dente præorbitali acuto. Pedes toti graciles.*

In the feet, and in the outer antennæ concealed by the beak, near *Chorilia*. Carapax long ovate, tumid, sparingly armed; horns of beak long, very slender, divaricate. First joint of outer antennæ broad, slightly longer than its breadth, armed with a spiniform process at apex. Orbit below and above interrupted with a rounded sinus, præorbital tooth acute. Feet all slender.

## LAHAINA OVATA.

*Carapax vix spinosus, subvillosus, papillis postero-dorsalibus rectè flexis, spinâ postero-laterali parvulâ, aliâque posticâ; rostri cornibus corpore paulo brevioribus, tenuibus, valde divaricatis, margine orbitali superiore latè fisso, spinâ anticâ brevi acutâ et lateraliter unidentatâ, posticâ prominenter rectangulatâ non acutâ. Articulus antennarum externarum Imus apice spinigerus. Pedes tenues, longi, manu perangustâ, nudâ.*

Carapax hardly spinous, only a small postero-lateral spine, and another behind; surface subvillous or papillose, papillæ of posterior half of carapax bent at a right angle; horns of beak very long (a little shorter than rest of body), slender, much divaricate. Breadth across the eyes about half greatest breadth. Upper margin of orbit with a broad, rounded sinus; anterior spine short, acute, and having a tooth on its outer side over the eye; posterior part of orbital margin salient, not acute, rectangulate. First joint of outer antennæ having an elongate spine at apex. Pterygostomial margin armed with a long, curved spine or horn, and another short spine. Feet slender, long; hand very narrow, nude, fingers contiguous.

Plate 2, fig. 1 *a*, male, enlarged three diameters; *b*, orbital margin and eye (1, base of beak; 2, apical spine of base of outer antennæ; 3, præorbital spine; 4, eye; 5, posterior part of orbit); *c*, under view of head; *d*, hand; *e*, papilla of posterior half of dorsum; *f*, papilla of the apex of the third joint of one of the legs.



Dredged at Lahaina, Maui, Hawaiian Islands.

Length, six and a half lines; greatest breadth, nearly three lines.

The specimen is in the soft-shell state, and it is difficult to say how far its papillose condition is, owing to its age or its moulting, and what of it is characteristic of the mature animal. The appearance of the individual, and especially the small size of the eyes, seem to show that it is nearly mature if not quite so. The orbit of the eye is very imperfect, the emargination or fissure in its upper and under sides being so great that the eye is not concealed when thrown back, except at its tip. The legs are nearly naked, but have a few hairs, and also a few papillæ similar to that figured in fig. 1 *f*. There are two such papillæ on the anterior side of each eye; one at apex, and the other a short distance from the apex. The horns of the beak are hairy, and very slender, and quite divergent. Behind the orbit, the body is abruptly narrower, and there is here a small spine on either side. The tarsi are very slender and red, with minute spinules.

GENUS SCYRA (*Dana*).

*Naxiæ antennæ orbitæque affinis. Rostrum laminatum, acutè furcatum. Articulus antennarum externarum primus undique angustus, apice externo ultra rostrum parce saliente; secundus depressus, tertio valde longior.*

Related to *Naxia* in the antennæ and orbit. Beak rather short, acutely furcate, laminate. First joint of outer antennæ narrow throughout, outer apex projecting a little either side of beak; second joint depressed, much longer than third. Feet of moderate length.

This genus has laminate antennæ like *Lissa*, but they are acute, and the outer antennæ are concealed beneath, excepting the tip of the flagellum. The outer margin of the first joint of these antennæ is straight and parallel with the medial line of the body; and at its outer basal angle there is a tooth, while the outer apical angle lies directly beneath the præorbital spine. There is no opening through the lower orbital margin. The epistome is transverse.

## SCYRA ACUTIFRONS.

*Ovata, fere inermis, rostro lamellato, cornibus ovato-lanceolatis, acutis, integris; spinâ præorbitali acutâ; regionibus carapacis valde prominentibus; regione medianâ per suturam profundam discretâ, postero-laterali tumidâ, cardiacâ simpliciter rotundato-tuberculiformi; margine carapacis postico medium tuberculo parvulo. Pedes antici elongati, manu carinatâ, brachio angulis pustuloso, carpo 3-4 carinato.*

Ovate, nearly unarmed; beak short, lamellar; horns ovato-lanceolate, acute, entire; superior præorbital spine acute; regions of carapax strongly pronounced; the median region divided from cardiac and lateral by a deep suture; postero-lateral region tumid, transversely indented, and posterior part rising into an obtuse point; cardiac region simply round-tuberculiform; posterior margin of carapax with a small tubercle at middle. Anterior feet rather long, hand carinate, arm with the angles pustulate, carpus with three or four carinæ.

Plate 2, fig. 2 *a*, male, natural size; *b*, under view of head; *c*, hand; *d*, female abdomen.

Oregon, C. Pickering, Exp. Exp.

Length of carapax, one inch and one line; greatest breadth, eight and a half lines; breadth across præorbital spines, three lines; length of beak, three and a half lines.

The outer antennæ have the outer angle of first basal joint acute or nearly so, but not produced into a spine; the second and third joints are flattened and oblong, the third little more than half the length of the second, and its apex not reaching to apex of beak. Pterygostomian region with the margin obtusely dentate. Eyes quite small. Legs somewhat pubescent.

*Scyra acutifrons*, DANA, Silliman's Amer. J. Sci., 2d Ser., ix. 269.



## SUBFAMILY II. PYRINÆ.

GENUS PYRIA (*Dana*).

*Oculi retractiles, breves, spinâ præorbitali carentes. Carapax sub-pyriformis depressus. Rostrum lamellatum, bifidum, sat breve. Antennæ externæ sub rostro celatæ. Pedes sat curti; antici tenues, reliqui valde compressi articulis tertio, quarto, quintoque complanatis; tarso tenui.*

Eyes retractile, short, without a præorbital spine. Carapax subpyriform in outline. Beak lamellar, two-horned, rather short. Outer antennæ concealed beneath the beak. Feet short; the anterior pair slender; eight posterior much compressed; third, fourth, fifth joints widely flattened; tarsus slender.

The carapax in the species on which this genus is founded, is but little convex, and but slightly uneven, with the different regions indistinct. The outline is even and convex from the angle just behind the eyes around by the posterior margin; the eyes are quite short and project but little from a shallow emargination just within this angle. The beak starts from the level of the eyes, and each part is ovate, being narrower at base than it is a short distance above. The eight posterior legs are remarkable for their flattened form; the fourth and fifth joints taken together, have an oblong, elliptical outline.

The outer antennæ have their moveable part arising just each side of beak, but it is generally directed inward and forward under the beak. The buccal area is broader than long. The second joint has the inner apex much produced. The epistome is quite short.

This genus is near *Herbstia* in its short, lamellar, divided beak; but is peculiar in its very much compressed legs, and in having its outer antennæ concealed beneath the beak.

## PYRIA PUBESCENS.

*Pubescens, inermis, omnino depressa, subpyriformis, latitudine post-orbitali valde majore quam dimidium latitudinis maximæ, marginibus*

*post-orbitalibus omnino integris nunquam constrictis, cornubus rostri ovatis, acutis, margine pubescentibus et subtiliter erosis. Pedes antici pertenuis; 8 postici marginibus hirsuti, articulo quinto vix duplo longiore quam latiore.*

Pubescent, unarmed, depressed, subpyriform, breadth just behind the eyes much greater than half the greatest breadth; margin of carapax behind the eyes entire, without any constriction; horns of rostrum ovate, acute, pubescent, and irregularly denticulate or uneven at margin. Anterior feet very slender; posterior eight with the two opposite margins very hairy, fifth joint scarcely twice as long as broad.

Plate 2, fig. 3 a, animal, enlarged.

Feejee Islands or Tongatabu; there is some uncertainty as to which of these neighbouring groups afforded the specimen.

Length, one-fourth of an inch. The eight posterior legs are subequal, and the tarsus is naked or nearly so. The fingers of the hand are tapering and acute, and the hand narrows towards its extremity.

#### SUBFAMILY MITHRACINÆ.

##### MITHRAX ASPER (*Milne Edwards*).

*Rostrum usque ad diametrum orbitalem divisum, cornubus bilobatis, divergentibus; carapace pubescente, granuloso, superficie plerumque inermi, tuberculis parvulis paucis ornatâ; marginibus lateralibus valde 7-spinoso-dentatis, dentibus duobus posticis minoribus et sub-dorsalibus. Pedes antici mediocres, brachio carpoque spinulosis; 8 postici apice articuli tertii uni-spinigeri. Antennæ externæ interdum sub rostro partim celatæ, articulis 2do 3tioque subæquis. Margo orbitalis inferior unidentatus. Regio pterygostomiana margine spinulosa.*

Rostrum divided to orbital line, horns divergent, deeply two-lobed at apex; carapax pubescent, granulous, mostly unarmed with spines,



but having a few tubercles; lateral margin strongly seven-toothed; teeth spiniform, two posterior smaller and subdorsal. Anterior feet of moderate size; arm and carpus spinulous; eight posterior with a spiniform tooth at apex of third joint. Outer antennæ often partly concealed by the beak; second and third joints subequal, hardly reaching to furcation at apex of either horn. Lower orbital margin one-toothed. Pterygostomian region spinulous or pustulate.

Plate 2, fig. 4 *a*, male of a specimen from the East Indies, natural size; *b*, under view of head.

Balabac Passage, north of Borneo; also from Peru?

Length of carapax of specimen from Balabac Passage, one inch; greatest breadth, ten lines; hand, six and a half lines long, or a little more than half the length of the carapax.

Length of the supposed South American specimen, three inches and two lines; same, excluding beak, two inches and seven lines; breadth across from tip to tip of sixth lateral spine, two inches and nine lines; breadth across, excluding these spines, two inches two lines. Length of longest lateral spines, nearly half an inch.

Below the outer spine on the margin of the orbital cavity there is an obtuse spine, and another exists on the surface, between the upper angle of the buccal area and the second tooth of the margin of the carapax. Outer maxillipeds and surface adjoining granulous. Posterior margin of carapax nearly straight, and with a small, prominent tubercle or spine at each angle; also a small spine or tubercle on the intestinal region.

#### SUBFAMILY CYCLACINÆ.

#### GENUS CYCLAX.

*Suborbicularis, paulo armatus, rostro parvulo, furcato, non lamellato.*

*Oculi prælongi, retractiles, orbitis obliquo-transversis spinâ externo-posticâ longâ, anticâ parvulâ. Antennæ externæ rostro remotæ, longæ, articulo primo apice bi-spinoso, spinâ externâ longâ. Fossæ anten-*

*narum externarum sub rostro partim excavatae. Pedes longi parte secundo sesquies longiore quam carapax, toti tenues, fere cylindrici.*

Nearly round, somewhat armed; beak small, furcate, not lamellar. Eyes very long, retractile, orbits somewhat obliquely transverse; outer posterior spine long, præorbital small. Outer antennæ remote from beak, long, first joint with two spinous processes at apex, the outermost long. Inner antennary cavity extends beneath the beak. Feet long, second pair one and a half times length of body, all quite slender, nearly cylindrical.

This genus is near *Mithrax*, but has the long legs and something of the habit of *Camposcia*. The eyes have quite long peduncles, as in *Camposcia*, but fold back into distinct orbits, which are nearly transverse. The buccal area is much wider in front than behind. The third joint of the outer maxillipeds is about as long as broad, and the next joint is articulated with its inner angle.

#### CYCLAX PERRYI.

*Carapax paulo oblongus, convexus, parce pustulatus, rostri cornubus subconicis, acutis, margine orbitæ superiore tri-spinoso, spinâ anteriore longiore et reflexâ, spinâ præorbitali parvulâ, post-orbitali crassiusculâ; marginibus carapacis antero-lateralibus 5-spinulosis, spinulis remotis, anteriore duplici; margine postico 2-spinuloso. Antennæ externæ dimidio carapacis longiores, pilosæ. Pedes carapace valde longiores, 8 posticis sparsim pilosis, tarso infra paulo piloso.*

Nearly orbicular, slightly oblong, convex, sparingly pustulate; beak short, horns subconical acute, superior margin of orbit with three spines, the anterior longest and reflexed, præorbital spine small, post-orbital, rather stout, and transverse in position; antero-lateral margins of carapax with five rather distant spinules, the anterior one double; also two on the postero-lateral margin. Outer antennæ longer than half the carapax, hairy. Feet much longer than carapax, eight posterior sparsely pilose, tarsus somewhat hairy within.

Plate 2, fig. 5 *a*, animal, enlarged; *b*, under view of head.



Pitt's Island, the northern island of the Kingsmill Group; collected from coral reef, April 30th, 1841, by Lieutenant O. H. Perry.

Length, two and a half lines. The surface of the carapax is uneven and the regions are distinct. In an upper view the outer antennæ appear to arise near the orbits, and quite distant from the beak. The second joint (the first moveable), is a little longer than the third. The eyes are much longer than half the space intervening between the two orbits.

The anterior pair of legs is about two-thirds the length of the second pair; the hand is long and slender; the second and third pairs are the longest, the second about one and a half times the carapax. The horns of the beak are separated by a narrow triangular interval.

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#### FAMILY EURYPODIDÆ.

##### SUBFAMILY EURYPODINÆ.

##### GENUS EURYPODIUS, *Guerin.*

IN the Eurypodii, the carapax is triangular, rounded behind, with in front a prominent, slightly arcuate beak, divided into two slender approximate horns, the furcation extending quite to the antennary fossæ. The upper surface of the carapax has a protuberant median region, and a prominence over the cardiac region, which is partly continued over the lateral regions. Each species known has on the medial line of the carapax two spines on the median region, one (or two on a transverse line) on the posterior part of the cardiac, and one on the posterior margin, besides sometimes others; also laterally there are one or more spines. There is a prominent post-orbital spine, and a small prominence, sometimes acute, just anterior to it.

The eyes form an oblong, ovoid prominence at the extremity of the pedicel, the longest diameter being vertical.

The septum between the inner antennæ is prominent, and is

often elongated into a spiniform process. The epistome is broader than long. The legs are long and rather slender, the thigh of the second or third pair of legs being usually not far from the length of the carapax, though sometimes considerably shorter. The fifth joint is flat, subfalciform, and the tarsus closes against the inferior margin.

## EURYPODIUS SEPTENTRIONALIS.

*Carapax obsoletè villosus, spinis paucis, in regione cardiacâ posterius duabus anterius unâ; spinâ post-orbitali acutâ et anteriore minori vel acutâ vel obtusâ; rostro supra complanato. Articulus antennarum externarum Imus dente subacuto extus ad basin armatus et juxta dentem processu subacuto. Pedes toti fere nudi; antici crassiusculi, brachio carpoque parce tuberculato-spinosis, manu scabro-granulatâ, paulo tumidâ, digito mobili cum dente parvulo tuberculiformi intus armato polliceque juxta basin cum dente simili. Pedes 8 postici longi, articulo pedis tertii tertio tuberculis setiferis parvulis biseriatis infra ornato, 5to longiore quam quartus, subtilissimè hirsuto, ejus margine inferiore versus apicem brevissimè hirsuto.*

Carapax obsoletely villous; spines few, on the cardiac region two posteriorly and one anteriorly; the post-orbital acute, and another smaller just anterior, either acute or obtuse. Beak flattened above. Immoveable basal joint of outer antennæ with a subacute tooth on outer side at base, and below this tooth, near by, a subacute prominence. Feet all nearly naked. Anterior feet rather stout; arm and carpus small spinoso-tubercular; hand scabro-granulous, rather tumid; moveable finger armed on inner margin with a small tuberculiform tooth just inside of middle, and immoveable finger with a similar one near articulation. Eight posterior feet long and slender; thigh with two series below of small setiferous tubercles; fifth joint longer than fourth, minutely hirsute; the lower margin towards apex short hirsute.

Plate 2, fig. 6 *a*, under view of head, enlarged two diameters; *b*, outer view of right hand, natural size; *c*, extremity of second pair of feet, natural size; *d*, male abdomen, natural size.



## Nassau Bay, Fuegia.

Length of carapax, two and five-eighths inches; of beak, five-eighths of an inch; anterior pair of legs, exclusive of hand, nearly as long as carapax; hand, two-thirds as long as carapax; thigh of second pair of legs, very nearly as long as carapax; whole leg, nearly two and a half times as long as carapax. The carapax has the two spines of the medial region prominent, and one small spine either side of the anterior. The lateral regions have a spine nearly in a line with the post-cardiac, and another smaller, forward and inward of this one; also, over the base of second pair of legs, two small spines. Posterior to the post-orbital spine, there is a tumid prominence in the sides of the carapax, and a small obtuse spine on the upper side of this prominence. Between the post-cardiac spine and the marginal behind, occupying the intestinal region, there is a low prominence with two obsolescent spines. The rounded tooth on the inner edge of the finger stands isolated; the rest of the edge is thin and denticulate. The third joint of the eight posterior legs is thinner below and has a series of small rounded points or tubercles. The posterior margin of the inner-antennary cavity, next to the outer antennæ, is reflexed downward, and a process from the base of the outer antennæ extends inward just anterior to this reflexed piece.

This species is near the *Audouinii*;\* but the upper surface of the beak is flattened, and the fifth joint of the eight posterior legs is longer than the fourth, instead of shorter. The length of the hairs on the lower edge of the fifth joint of the eight posterior legs, is not one-fourth the breadth of the joint, while it is one half the breadth in the *Audouinii*. The third and fourth joints of these legs also are not as nearly cylindrical.

*Eurypodius septentrionalis*, DANA, Sill. Am. J. Sci., 2d Ser., ix. 270.

\* D'Orbigny, Voy. dans L'Amérique Merid., Crust., p. 3, pl. 1. The specific description of the *E. Audouinii* and the drawing, represent the fifth joint as shorter than the fourth; while the remarks following the specific description make it longer; the last is evidently an error.

## EURYPODIUS BREVIPES.

*Carapax valde tumidus, spinis paucis, brevibus, in regione cardiacâ posteriorius duâbus antèrius unâ; rostro supra complanato breviorè. Articulus antennarum externarum 1mus extus ad basin dente armatus et juxta dentem processu subacuto. Pedes breves, hirsuti, primi subtenués, brachio carpoque cum 3-4ve tuberculis minutis supra armatis, manu lineari, tenui, lævi, margine digiti interno denticulato. Pedes octo postici crassiusculi, valde breviores, articulo 3tio pedis secundi valde breviorè quam carapax, articulo 5to lato et crasso, longiorè quam quartus, non duplo longiorè quam tarsus.*

Female: carapax very tumid, with few spines, two little prominent on the cardiac region posteriorly, and one anteriorly. Beak flattened above, rather shorter than in preceding species. Outer side of basal joint of outer antennæ with a small prominence near base, and another just posterior. Feet short; hairy on the margins of all the joints. First pair rather small; arm and carpus with three or four small tubercles above; hand narrow linear, rather thin; inner margin of finger denticulate. Eight posterior feet rather stout, third joint of second pair much shorter than carapax, fifth joint broad and stout, longer than fourth joint, and not twice as long as sixth (tarsus).

Plate 2, fig. 7 *a*, animal (female), natural size; *b*, abdomen of female; *c*, under view of head.

Nassau Bay, Fuegia.

Length, one and five-eighths inches; of beak, three and a half lines; of third joint of second pair of legs, one inch; of fifth joint of same pair, eight lines, and breadth of same, two and a half lines (or about one-third the length); length of tarsus of same pair, five and one-third lines.

The carapax has only two spines on the median region, and these are prominent; also a prominent acute, postero-lateral, in the same line with the post-cardiac, besides one or two minute, near by, forward and inward, also two spines on the lateral region, over base of second



pair of legs; also, one or two spines on the antero-lateral region, anteriorly. The outer maxillipeds are hairy throughout. The inter-antennary septum is produced into a long spine, and the margin behind the fossettes, next to the base of outer antennæ, is reflexed as in the *E. septentrionalis*.

*Eurypodius brevipes*, Sill. Am. J. Sci., 2d Ser., xi. 270.

#### EURYPODIUS AUDOUINII (*Edwards and Lucas*).

We refer here, with hesitation, a specimen (male), which is in an imperfect condition in our collections, owing to its having been taken while the shell was in the soft state. It has the fifth joint of the eight posterior legs about as long as the fourth, or a little shorter in the two posterior pairs. The hand is stout and tumid, and the finger has a rounded prominence on the inner margin, inside of middle, which is thin and denticulate like the rest of the edge, and not a rounded tubercle like that of the *septentrionalis*. The surface below is covered with an exceedingly short but rough down; the legs are nearly bare. It is probably from Nassau Bay, Fuegia.

#### EURYPODIUS LATREILLII.

Plate 3, fig. 1 *a*, under view of head, enlarged four diameters; *b*, exterior view of right hand, *ibid.*; *c*, extremity of third pair of legs, *ibid.*

Valparaiso, Chili.

This species differs from the preceding in having the fingers of the hand without any appearance of a tooth-like prominence on the inner edge, the edges being simply and evenly denticulate. Moreover, the margin of the antennary fossettes behind, is not reflexed adjoining the immoveable basal joint of the outer antennæ.

A specimen an inch in length has the following characters. The beak is about one-fourth the whole length of the carapax; it is flattened above, but the flat surface is placed a little obliquely. The

edges are hairy, and in the specimen, the hairs are longer than the breadth of the beak. The second post-orbital spine is prominent and obtuse; the first quite short and obtuse. The carapax has two spines on the medial region, one on the cardiac region, one either side in the same line nearly on the postero-lateral region, and another, forward of this, a little more outward; also one on the middle of posterior margin. The lateral portions of the carapax are somewhat hairy.

The immoveable basal joint of the outer antennæ has no spinous process on outer side, near base, and no distinct tooth just posterior.

The first pair of feet is about as long as the carapax. The others are much longer and more slender. The arm has two small tubercles on the upper side; the next joint a few more; the hand is linear and rather thin, with the upper and under margins hairy. The following legs have the thigh nearly cylindrical, with a few hairs above and below; the fifth joint is longer than the fourth.

The abdomen of the male is narrow, with the last joint subtriangular.

*Eurypodius Latreillii*, GUERIN, Mem. du Mus., xvi. pl. 14, and Iconogr. Crust., pl. 11, f. 1.

—, EDWARDS, Crust., i. 284.

—, Voyage de la Coquille, pl. 2, f. 1. This figure represents the first post-orbital spine of nearly the same size as the first; while in Guerin's figure and our specimens it is very short, and the second very much longer.

#### GENUS OREGONIA, Dana.

*Rostro, antennis, oculis, spinâ postorbitali pedibusque elongatis Eurypodio affinis. Pedes tenues, octo postici articulum quintum aliosque subcylindrici, nunquam compressi.*

Resembling *Eurypodius* in beak, antennæ, eyes, post-orbital spine, and feet. Feet slender, the anterior little shorter than second pair, the eight posterior pairs, with the fifth joint, as well as others, cylindrical.

The main distinction between this genus and *Eurypodius*, consists in the fact, that the fifth joint of the eight posterior legs is slender



cylindrical, instead of compressed and broad, and consequently, the tarsus does not shut against this joint.

The beak is bifid and long, with the horns in contact, and not arcuate in a vertical plane like *Eurypodius*; though sometimes with a slight curve in a horizontal plane. The eyes and post-orbital spine are rather long, and the former closes back, reaching to the spine, though not concealed in this position scarcely more than in *Eurypodius*. The distance between the orbits is about twice the breadth of the beak at base. The carapax has a triangular form, rounded behind; it has the medial region tumid and prominent; a transverse low post-medial region; a small cardiac region, and a large swelling lateral region. The surface is rough, with minute granules or obsolete tubercles, and short hairs arising from them, but without any prominent spines, as far as the species have been observed.

The septum between the inner antennæ is prolonged into a spinous process. The epistome is large, but transverse. The buccal area is nearly square, the breadth slightly exceeding the length. The third joint is triangular. The abdomen has seven joints in the male.

#### OREGONIA GRACILIS.

*Carapax breviter sparsimque pubescens, rostro valde longiore quam latitudo inter-orbitalis. Pedes breviter sparsimque pubescentes, tenues; primi secundis paulo breviores, brachio tuberculis minutis supra infraque ornato, manu fere lineari, digito intus prope basin unidentato alioque denticulato. Abdomen maris sublineare, margine laterali versus apicem excavato, apice truncato.*

Carapax short and thin pubescent, beak much longer than distance between the orbits. Feet short and thin pubescent, slender; first pair a little shorter than second, arm with minute tubercles above and below, hand nearly linear, finger having a small tooth within, near base, and the rest of the edge denticulate. Abdomen of *male* sublinear, margin either side towards apex excavate, apex truncate.

Plate 3, fig. 2 *a*, animal (male), natural size; *b*, under view, enlarged; *c*, abdomen, natural size.

Puget's Sound, C. Pickering. Exp. Exp.

Length of carapax (including beak, as usual), one and seven-twelfths inches; of beak, five and one-third lines; breadth between the orbits, four lines; greatest breadth of carapax, ten lines; first pair of legs, a little longer than carapax; posterior pair, one and one-third the carapax; second pair over one and a half times carapax. The hand is compressed, and the upper edge is obtuse, with hairs in minute tufts. The fifth joint of eight posterior legs is closely covered with very short hairs, besides tufts of hairs a little longer and divergent; tarsus rather longer than half the preceding joint. The horns of the beak have hairs or setæ above in a longitudinal range. The pedicel of the eyes has a small prominence on anterior side. The immoveable basal joint of outer antennæ has the outer anterior angle rounded and spinulous. The septum between the inner antennæ is elongated, spine-like.

*Oregonia gracilis*, DANA, Sill. Am. J. Sci., 2d Ser., xi. 270.

#### OREGONIA HIRTA.

*Carapax pedesque sparsim hirti, rostro tenui, brevior quam latitudo inter-orbitalis. Pedes paulo breviores, digito pedis antici intus æque denticulato. Abdomen maris subellipticum, apice transversim triangulatum, feminae fere orbiculatum.*

Carapax and feet sparsely rough hairy, beak slender, shorter than inter-orbital space. Feet rather shorter than in preceding species. Finger of anterior feet with inner edge evenly denticulate and no prominent tooth. Abdomen of *male* subelliptical, at apex transversely triangular; of *female*, nearly orbicular.

Plate 3, fig. 3 *a*, front of carapax, natural size; *b*, abdomen, enlarged two diameters.

Puget's Sound, C. Pickering.

This species is near the preceding, but has a more rough hairy look, is less slender and shorter in its beak, with a different abdomen.

*Oregonia hirta*, DANA, Silliman's Am. J. Sci., 2d Ser., xi. 270.



## FAMILY PERICERIDÆ.

## SUBFAMILY PERICERINÆ.

## PERICERA TRIGONA.

*Feminæ*:—*Carapax bene triangulatus, triangulo equilaterali, spinâ postero-laterali longâ, crassâ, complanatâ; superficie supra infraque breviter densissimèque villosâ, villis defrictis vero nitidè porcellanâ; spinis dorsalibus duobus, unâ medianâ, alterâ cardiacâ; rostro mediocri, cornubus divergentibus; spinâ præorbitali perbrevis, subacutâ. Regio pterygostomiana uni-spinosa. Articulus pedum 3tius minutè tuberculatus et apice plerumque spinoso-productus; manu tenui, digitis omnino contiguus.*

*Female*:—Equilaterally triangular, postero-lateral spine long, very stout, flattened; upper and under surface dense and short villous, on removing the villous coat, shining porcelainous; back with two median spines of moderate size, one to the medial region, one to the cardiac; beak of moderate length; horns divergent. Præorbital spine very short, subacute. Pterygostomian region with a single tooth. Third joint of feet minutely tuberculous, and the apex for the most part prolonged and subacute; hand slender, finger and thumb in contact within.

Plate 3, fig. 4 *a*, animal (female), natural size; *b*, under view of head; *c*, female abdomen, enlarged two diameters; *d*, hand of female, ditto.

Feejee Islands.

Length from tip of beak to posterior apex, one and one-fourth inches; breadth across from tip to tip of lateral spines, one and one-fourth inches; breadth across the eyes, half an inch; distance between tips of beak, one-sixth of an inch; distance between stomach and cardiac dorsal spines, four lines; and the same between the cardiac spine and the posterior apex.

Resembles closely the *trispinosa*, but differs widely in its proportions, the breadth across the lateral spines being much greater in proportion to the length. The surface is very strongly porcelainous after removing the villous coat, and in the specimen thus examined, it had a whitish flesh colour. There is a very minute point on the sides of the anterior part of the stomach region. The horns of the beak are divergent, but not widely so. The anterior spinous process of the basal joint of the outer antennæ projects its whole length beyond the margin of the carapax, between the beak and the eyes. The anterior legs are much longer than the second pair, and the second and following pairs are subequal, the second a little the longest. The female abdomen is round-elliptical.

GENUS TIARINIA, Dana.

*Oculi non retractiles, orbitâ tubiformi inclusi. Rostrum bifidum, cornubus plerumque contiguus. Carapax subpyriformis, tuberculatus aut pustulatus, tuberculo cardiaco tuberculis tribus aut pluribus facto. Articulus antennarum externarum 1mus latissimus, spinâ apicali non armatus, angulo externo-apicali interdum paulo saliente et subacuto. Spina præorbitalis prominens. Pedes 1mi 2dis non longiores.*

Eyes not retractile, enclosed in a tubular orbit. Beak bifid, horns for the most part contiguous. Carapax subpyriform, tubercular or pustulous above, the cardiac tubercle or prominence consisting of three small tubercles. Basal joint of outer antennæ very broad, not armed anteriorly with a spine, outer angle sometimes a little salient and subacute. Præorbital spine prominent. Anterior feet not longer than second.

The genus *Tiarinia* includes the *Pericera cornigera* and some other species of *Pericera*. They differ from *Pericera* in the beak, the character of the surface, the basal joint of the outer antennæ, and also in less tendency to a triangular form in the outline. Moreover the anterior legs are not longer than the second pair; and the cavity for the pair of inner antennæ is not wider than long. When the first basal joint of the outer antennæ has a spine anteriorly, it is a prominence of the outer angle, and not a process near the articulation with the next joint.



The regions of the carapax are well pronounced. The medial region is large and oblong, and embraces several small tubercles which are sometimes nearly obsolete. The tubercles are often as follows, beginning anteriorly: two, distant from one another, in a line between the eyes; then, one medial; then four, two either side of the medial line more or less distant from it; then, on the medial line, two; next, two in a transverse line; next, two minute in a transverse line, just on the posterior limits of the medial region. The post-medial region is small and has one transverse tubercle, with sometimes others subsidiary; the cardiac region has three tubercles forming a single prominence, sometimes with two others smaller anteriorly, and others smaller posteriorly; the intestinal region is low without tubercles, or has three tubercles clustered, smaller than those of the cardiac region. The lateral regions are rounded and tumid, and embossed with small tubercles; a part either side of the post-medial region forms a separate prominence, consisting of a few clustered tubercles.

The two anterior pairs of legs are nearly of the same length, and the finger and thumb of the hand may be in contact throughout or only at their tips.

The abdomen of both sexes is seven-jointed.

The tarsus has minute corneous points on the inner surface, and longer hairs.

TIARINIA CORNIGERA? (*M. Edwards.*) Dana.

*Maris*:—*Crassiuscula, supra tuberculata pustulata et granulata, pone oculos paulo constricta, regione gastricâ prominente, latitudine maximâ longitudinem post-orbitalem æquante, latitudine trans-orbitali dimidio minore quam latitudo maxima; rostro multo breviorè quam latitudo transorbitalis, cornubus omnino contiguus. Antennæ externæ rostro multo longiores, articulo primo subquadrato angulo externo prominente, subacuto, articulis duo sequentibus longè ciliatis, 2do parce longiore quam tertius, subspatulato. Pedes secundi sequentibus duplo longiores. Pedis antici manus tumidula, oblonga, levis, digitis latissimè hiantibus, articulo tertio tuberculato. Pedes octo postici subtilissimè hirsuti, articulo tertio parce tuberculato.*

*Male*:—Rather stout, above tuberculate, pustulate and granulate,

somewhat constricted behind the eyes, median region prominent, greatest breadth equalling post-orbital length, and more than double trans-orbital breadth; beak much shorter than trans-orbital breadth, horns throughout contiguous. Exterior antennæ much longer than the beak, having outer angle of basal joint prominent and subacute, following part of organ long ciliate, second joint subspatulate, sparingly longer than the third joint. Hand of anterior feet oblong, somewhat tumid, smooth, fingers very widely gaping, third joint tubercular; second pair twice as long as either of the following; all four posterior pairs very minutely hirsute, third joint more or less tuberculate.

Plate 3, fig. 5 *a*, male, enlarged two diameters; *b*, under view of head; *c*, abdomen, enlarged two diameters; *d*, hand, enlarged two diameters; *e*, extremity of third pair of legs, left side, inner view.

Length of carapax, of specimen examined, ten and a half lines; greatest breadth, eight lines; breadth between tips of orbital acanthi, three lines; length of beak two lines.

The *T. cornigera* is stouter than either of the following. The cardiac prominence consists of three prominent tubercles, the posterior one of which is subdivided, besides two others anteriorly, and others small and granulous posteriorly. The tubercles are smooth at summit, but are set around with granules, or more properly hairy points, like the hirsute points of the legs, though shorter. The beak, just back of the orbits, and the sides of the carapax, are hairy, and there is also a tuft or two either side of the posterior part of the stomach or median region.

*Pisa cornigera*? LATR., Encyc., x. 141.

*Pericera cornigera*? EDW., Crust., i. 335.

—, ADAMS and WHITE, Samarang Crust., 18.

#### TIARINIA GRACILIS.

Maris:—*Carapax pone oculos paulo constrictus, latitudine carapacis maximâ longitudinem post-orbitalem fere æquante, latitudine trans-orbituli sat majore quam dimidium latitudinis maximæ; rostro antennis externis brevior, cornubus apice parce divergentibus, lateribus*



*non dentigeris. Antennæ externæ ciliatæ, articulo primo angulum externum producto, subacuto, articulis secundo tertioque angustis, ad apicem parce latioribus. Manus tenuis, digitis omnino contiguus. Pedes 8 postici sparsim pubescentes, articulo tertio plus minusve tuberculato.*

Carapax somewhat constricted behind the eyes; greatest breadth of carapax nearly equalling post-orbital length; trans-orbital width considerably greater than half the greatest breadth; beak shorter than outer antennæ; horns a little divergent at apex; sides without teeth. Outer antennæ ciliate; first joint with outer angle projecting and subacute; second and third joints narrow, slightly broadest at apex. Hand slender; fingers throughout contiguous, or very nearly so. Eight posterior feet sparsely pubescent; third joint more or less tuberculate.

Plate 3, fig. 6 *a*, male, enlarged three diameters; *b*, under view of head; *c*, male abdomen, enlarged three diameters; *d*, female abdomen, natural size.

Dredged up in the Sooloo Sea.

Length of male, six lines; greatest breadth, three lines; breadth between orbital acanthi, two lines; length of female, eight lines.

In the female the tubercles of the medial region and generally of the anterior half of the carapax were rather indistinct; but other characters are the same as for the male.

This species differs in its proportions from the *cornigera*; in the divergence of its rostral horns at tip, from the *cornigera* and *setigera*; in not having the legs fringed with long, reddish-brown, woolly hair, from the *tiarata*. The male has its tubercles prominent, but the medial region is not much raised as a whole above the rest of the surface; the tubercles of the posterior part of lateral region are conical. The abdomen of the male resembles that of the other species described (See fig. 6 *c*). That of the female is oblong elliptical with the extremity obtuse.

## TIARINIA ANGUSTA.

*Maris*:—*Carapax angustior, pone oculos vix constrictus, latitudine maximâ multo brevior quam longitudo post-orbitalis, latitudine trans-orbitali parce minore quam latitudo maxima; rostro longo, cornubus apice conspicuè divergentibus et latera cum 3-4 dentibus minutis remotè armatis. Antennæ externæ rostro dimidio breviores, articulis 2do 3tioque tenuibus. Manus tenuis, digitis omnino contiguus. Pedes 8 postici pubescentes, secundi 3tiis duplo longiores; articulus 3tius paris antici plus minusve tuberculatus.*

*Male*:—Narrow, tuberculate and granulous above, hardly constricted behind the eyes, medial region hardly prominent, greatest breadth much shorter than post-orbital length, and but one-fourth greater than trans-orbital breadth; beak long, horns rather strongly divergent at apex, three or four minute teeth remote from one another, set along the outer side of lower half of beak. Outer antennæ half shorter than beak, second and third joints slender. Hand slender, fingers throughout contiguous or nearly so. Eight posterior feet pubescent; second pair twice as long as following; third joint of anterior pair sparingly small tuberculate.

Plate 3, fig. 7 *a*, male, enlarged three diameters; *b*, outer antennæ.

Dredged up off Sooloo Harbour.

Length, six lines; greatest breadth, two and a half lines; beak, two lines long; distance between tips of orbital acanthi, two lines.

This species is much narrower than the others, and has the beak one-third the whole length, with the tips much divergent. The distance across the eyes, instead of being half the greatest breadth, is about three-fourths the same. Behind the cardiac prominence, which consists of three tubercles, there is another similar but smaller prominence on the intestinal region. The beak is hairy, as usual, and there are a few short hairs at the tip of the orbital acanthus. The teeth on the outer side of the beak are minute and hardly seen without special care on account of the hairs.



GENUS PERINEA (*Dana*).

*Pericerae affinis.* Orbita antice paulo aperta eoque non bene tubulata, margine superiore non unifisso. Articulus antennarum externarum 1mus oblongus, antice non latior, apice externo paulo productus. Rostrum brevisculum, cornubus divaricatis. Carapax tumidus, paucis tuberculis tumidis ornatus.

Near *Pericera*. Orbit, anteriorly somewhat open and not shut in as in *Pericera*; superior margin without a fissure. First joint of outer antennæ oblong, not broader at apex. Beak rather short, furcate, horns separated. Carapax tumid, having a few tumid tubercles.

The orbit in this genus is not so completely tubular as in *Pericera*, the anterior side being more open, so that the eye has some forward motion. The posterior side only projecting, there is some resemblance to the orbit in *Leucippa*. Moreover, the first basal joint of the exterior antennæ is oblong, not broad at apex. The body of the species seen is very tumid, and the tubercles are prominent on the posterior half, though not acute.

## PERINEA TUMIDA.

*Carapax valde tumidus, brevis (lat. maximâ long. post-rostralem æquante), lateribus rotundatis, regione medianâ convexâ minutè bituberculatâ, regione cardiacâ largè tuberculiformi, laterali tumidè tri-tuberculatâ. Rostrum breve, latitudine trans-orbitali fere duplo brevius. Spina præ-orbitalis brevis, subacuta. Pedes breves, articulis 3tio 4toque spinosè tuberculatis, manu crassâ, digitis latissimè hiantibus, digito mobili prope basin unidentato.*

Very tumid, short (post-rostral length about equal to greatest breadth), sides rounded and thick, medial region convex, with two minute tubercles, cardiac region with a large prominent tubercle, and the lateral with three prominent tubercles either side. Beak short, nearly twice shorter than the trans-orbital breadth. Præorbital spine short, subacute. Feet short, third and fourth joints spinoso-

tuberculate; hand very stout, fingers very widely gaping, the upper unidentate near base. First joint of outer antennæ produced at apex, but not acute.

Plate 4, fig. 1 *a*, male, enlarged four diameters; *b*, under view, twelve diameters; *c*, abdomen of male, four diameters; *d*, anterior legs; *d'*, *d''*, views of hand and fingers; *e*, one of the eight posterior legs; *f*, tarsus of the same.

Dredged at Lahaina, Maui, Hawaiian Islands.

Length, three and a half lines; greatest breadth, a little more than three lines. The body is very short and thick, with rounded sides, and the posterior margins are villous. Just anterior to the cardiac tubercle, at some little distance from the medial line, there is on either side a very small tubercle in addition to those above mentioned. The fingers of the hand have on the inner margin a few tufts of setæ towards apex, as shown in fig. 1 *d*. The posterior legs have the margins densely villous. The first joint of the outer antennæ has a prominent line, extending from the outer apex obliquely backward and inward to the inner basal portion, so as to appear to have a triangular under surface, at first sight, with the apex very narrow; but it widens within somewhat, where it gives insertion to the next joint.

#### HALIMUS TUMIDUS.

*Rostris cornua subconica, latè divaricata. Carapax valde tumidus, latere 4-6 spinulis minutis armato; regione medianâ tribus tuberculis parvulis triangulatè ornatâ, alio tuberculo obsolescente posteriore; regione cardiacâ tuberculis obsolescentibus notatâ. Pedes pubescentes, sat breves; manu tenui, basin latiore, digitis fere contiguis, tenuibus; articulo 5to pedis postici duplo longiore quam latiore. Articulus antennarum externarum 1mus apice externo valde productus extusque 2-3-spinulosus.*

Horns of beak subconical, of moderate length, widely divaricate. Carapax tumid, sides armed with four to six spinules; stomach region with three small tubercles triangularly placed, and another faint



one behind; cardiac region with obsolescent tubercles. Feet pubescent, moderately long; hand slender, broader at base; fingers nearly or quite contiguous, slender; fifth joint of posterior feet twice as long as wide. First joint of outer antennæ spiniform at outer apex, and on outer side 2-5 spinulous.

Plate 4, fig. 2 *a*, female, enlarged two diameters; *b*, under view of head, enlarged six diameters; *c*, side view; *d*, female hand; *d'*, male; *e*, extremity of last pair of legs; *f*, male abdomen, five diameters; *g*, female abdomen, *ibid*.

Shores of New South Wales, Australia.

Length of carapax, seven lines; greatest breadth, four and a half lines; breadth of beak at tips, one and three-fourths lines.

The buccal area is a little broader than long; the third joint of the outer maxillipeds is as long as broad, with the anterior margin entire and rounded; the fourth joint articulating in a large emargination of the inner anterior angle of the third. The pterygostomian area has a single spine on the margin. The beak extends forward in the line of the surface posterior to it, and owing to the tumid character of this part of the carapax, the direction of the beak is inclined downward and forward. It almost covers the outer antennæ throughout. Of the lateral spinules of the carapax the first is the post-orbital; then there are two, one nearly over the other; then, posterior to these on the sides of the branchial region, two or three others. The surface of the carapax bears a few tufts of setæ on its small tubercles.

#### GENUS PUGETTIA (*Dana*).

*Carapax depressus, superficie fere inermis, spinâ præorbitali prominenti instructus, margine pone orbitam utrinque expanso. Articulus pedum 4 posticorum 5tus cylindricus.*

Carapax depressed, nearly unarmed above; a stout præorbital spine on either side behind the orbit, sides much expanded; fifth joint of the four posterior feet cylindrical.

This genus differs from *Leucippa*, which it resembles in appearance,



in its prominent præorbital spine, and also in having the outer antennæ properly exposed, although usually lying inward under the beak. The species are still nearer *Halimus* in form and structure, but the four posterior legs have the penult joint cylindrical. The surface is smooth or nearly so; there are traces of two distant tubercles in the same transverse line on the median region, similar to those of some *Epialti*.

## PUGETTIA GRACILIS.

*Carapax lyratus, paulo convexus, latus, pone oculos utrinque largè triangulato-expansus cum angulo acuto, margine postero-laterali spinâ crassâ armato, latitudine ante-medianâ vix minore quam latitudo post-mediana, regione medianâ tumidâ, minutè bituberculatâ. Pedes antici crassi, longi, brachio supra carinato, dentato, carpo bicarinato, digitis fere omnino contiguus. Pedes octo postici nudiusculi, articulis 3tio 5toque subcarinatis, 4to dorsum depresso, 5to versus apicem inferiorem penecillum setarum brevissimum ferente.*

*Carapax* lyrate, somewhat convex, broad; on either side behind the eyes a large triangular expansion with angles acute; outer margin of postero-lateral region armed with a stout spine; gastric diameter but little less than the cardiac. Beak setigerous, horns somewhat divaricate. Medial region tumid, minutely tuberculate, and anterior to each tubercle a series of curled setæ. Anterior feet stout and long, arm carinate above and dentate, carpus bicarinate, fingers mostly contiguous within. Eight posterior feet nearly naked, third and fifth joints subcarinate, fourth depressed on upper side, fifth with a short pencil of setæ below, towards apex.

Plate 4, fig. 3 *a*, male, natural size; *b*, under view of head, enlarged four diameters; *c*, abdomen of male, natural size.

Puget's Sound.

Length of largest specimen seen, a female, one inch and four lines; breadth across from angle to angle of projection behind the eyes, ten and one-fourth lines; breadth across from tip to tip of lateral spine, eleven and one-fourth lines; length of beak, nearly four lines; length



of anterior feet, one inch and four and a half lines; length of hand, seven and a half lines; length of second pair of feet, one inch and eight lines; length of third pair of feet, one inch and two lines; length of posterior feet, one inch.

The carapax is smooth and naked. The cardiac region is very slightly tumid, and in younger individuals, it has at centre a minute tubercle, which is wanting in the largest, and there is in all a trace of a tubercle between this and the lateral spine. The margin of the pterygostomian region has three or four small teeth. The outer angle of the first joint of outer antennæ is subacute. In an under view, the peduncles of the eyes are visible for more than twice the distance they are in an upper view. The palpus of the outer maxillipeds has a re-entering angle on outer margin below the apex of the long joint. There are two or three setæ to apex of peduncle of eyes.

#### PUGETTIA RICHII.

*Sat grandis.* Carapax subtriangulato-ovatus, pone oculos alatus, alâ bilobatâ, lobis acutis, posteriore elongato et fere transverso; spinâ laterali subposticâ grandi; regione medianâ 4 tuberculis spiniformibus armatâ, cardiacâ uno, intestinali uno, postero-laterali utrinque duobus. Pedcs antici longi, crassi, brachio paulo tuberculato, margine antico subtilissimè scalpto, carpo valde cristato, digitis (maris) latè hiantibus, apice denticulatis, digito mobili versus basin infra unituberculato.

Rather large. Carapax subtriangulato-ovate, an alate expansion behind the eyes, which is bilobate, lobes acute, the hinder long, and nearly transverse, postero-lateral tooth large, horns of beak quite long, narrow, convex above, hirsute, median region with four spiniform tubercles, cardiac region with one, intestinal with one, postero-lateral either side with two, one some distance in advance of the other. Feet long; anterior pair in male stout, arm a little tuberculate, anterior margin very finely scratched, carpus strongly cristate, fingers (of male) widely gaping, denticulate at apex, moveable finger having an isolated tubercle towards base.

Plate 4, fig. 4 *a*, male, natural size; *b*, abdomen, *ibid.*; *c*, outer antennæ; *d*, exterior maxillipeds; *e*, fingers of hand, outer view.

From California. William Rich, Esq.

Length of carapax, one inch and eleven lines; breadth between tips of teeth across stomach region, one inch and three and a half lines; breadth between tips of teeth across cardiac region, one inch and five lines; length of anterior legs, three inches and five lines.

In the specimen before us, the eight posterior legs are mutilated. The third joint of the second pair is slender subcylindrical, not at all carinate, and measures one inch and one line long. The pterygostomian region has three small spiniform teeth. The first joint of the outer antennæ has a tooth on the outer side near middle. The tubercles of the carapax, the more unequally-lobed alate expansion behind the eyes, and the form of the anterior legs, distinguish this species readily from the preceding. This species is named in honour of its discoverer, the Botanist of the Exploring Expedition.

#### SUBFAMILY MENÆTHINÆ.

#### GENUS MENÆTHIUS.

The specimens of this genus collected by the author have the following characters in common, in addition to those stated as generic by Milne Edwards.

Carapax subtriangular. Beak narrow and edged with short curled setæ, simple, sometimes emarginate at apex. Præorbital spine elongate, subacute. Sides of carapax with three largish teeth, the two anterior often bilobate, so as to make in such cases *five* teeth alternately unequal. Surface of carapax more or less uneven or tuberculate. Cardiac region prominent and showing at top three small tubercles triangularly placed; one or two small prominences between the cardiac protuberance and the lateral spine, forming a nearly straight range across the carapax. The medial region is prominent, with two tubercles anteriorly, often nearly coalescent into one, and usually having anteriorly a small tuft of setæ; also another tubercle posteriorly, or else three small tubercles placed triangularly. Behind the cardiac prominence often a small tubercle; and posterior margin of carapax either entire or with a small prominence near base of posterior legs and sometimes another medial one.

Eyes project laterally but little. Immoveable basal joint of the



outer antennæ narrow anteriorly, the outer angle prolonged into a spine, which is usually obtuse. Cavity of the inner antennæ with the posterior margin obliquely sloping forward towards the cavity, and the outline of the whole, this part included, elliptical. Exterior maxillipeds with the third joint subtriangular, the outer anterior angle being prolonged outwards much beyond the line of the outer margin of the second joint, and subacute.

In the males (with one exception?) the abdomen is quite narrow; the penult segment is longer than the preceding, and has a low salient angle on its opposite sides.

Hand of the first pair of legs, with the fingers either in contact throughout, or only at the extremity; inner margins wholly or partly denticulate; in some males, a broad tooth near articulation.

Area either side of mouth with the margin bidentate.

#### MENÆTHIUS ANGUSTUS.

*Carapax sat tuberculatus, perangustus (latitudine multo minore quam longitudo post-rostralis), dentibus lateralibus tribus, duobus anticis bilobatis; rostro longo, emarginato; regione medianâ tumidâ, posticè bituberculatâ et antè areâ triangulatâ notatâ; regione post-medianâ brevi, unituberculatâ; regione intestinali grandi unituberculatâ, margine postico rotundato, integro.*

Carapax tuberculous, quite narrow (greatest breadth much less than length of post-rostral part), lateral teeth three, the two anterior bilobate; beak long, emarginate, medial region tumid posteriorly, having two small tubercles, and just anterior to them an area slightly prominent of a triangular shape, post-medial region short, unituberculate, intestinal region large, with one tubercle, posterior margin of carapax rounded, entire.

Plate 4, fig. 5 *a*, carapax, enlarged three diameters; *b*, under view of mouth, &c., enlarged six diameters.

Locality doubtful. Expedition collections.

Length, five and one half lines; greatest breadth, three lines; length

of post-rostral part of carapax, four lines. A much narrower species than the *subserratus*, though resembling it. The first moveable joint of the outer antennæ is hardly one-sixth the length of the beak, while it is between a third and a fourth part in the *subserratus*. In the same transverse line with the post-medial tubercle there are either side two small tubercles.

MENÆTHIUS DEPRESSUS.

*Carapax breviter tuberculatus, latus (latitudine vix minore quam longitudo post-rostralis); dentibus lateralibus tribus obtusis, nullis bilobatis; rostro longo apice emarginato; regione medianâ tumidâ, postice tumidulâ; regione postmedianâ fere obsoletâ vel parce uni-tuberculatâ, regione intestinali uni-tuberculatâ. Abdomen latum, oblongo-subellipticum. Manus tenuis, digitis omnino contiguus, brachio parce tuberculato.*

Carapax low tubercular, broad (breadth hardly less than post-rostral length); three lateral teeth obtuse, none bilobate; beak long, emarginate at apex; median region tumid, posterior part prominent, but not divided into two or more tubercles; post-medial region nearly obsolete, or with a trace of a tubercle; intestinal region with one tubercle. Abdomen broad, oblong subelliptical. Hand slender, fingers in contact throughout by their inner margins; arm with a few small tubercles.

Plate 4, fig. 6 *a*, specimen from the Sooloo Sea, enlarged four diameters; *b*, right hand; *c*, outline of abdomen (segments not determined); *d*, beak of specimen from Upolu; *e*, abdomen of Sooloo specimen.

Dredged up in the harbour of the large island of Sooloo; also found at the Samoan Islands, about the coral reefs of Upolu.

Length, three lines; greatest breadth, two lines.

The abdomen resembles much that of females, but is only about half the usual width, not being probably fully developed. The articulations are all distinct in the Samoan specimen, but they may be in part only sutures. The Sooloo specimen has the posterior margin of the carapax slightly pointed at centre, and either side near base of



legs there is a small setigerous prominence. In the Upolu specimen, this character is apparent, but not very distinct. The anterior medial tubercles are furnished with a tuft of short, curled setæ.

It seemed probable at first that the Samoan specimen might be the young of the *subserratus*. But the characters given appear to separate them.

MENÆTHIUS SUBSERRATUS, *Adams and White*.

Plate 4, fig. 7 *a*, carapax of male, enlarged two diameters; *b*, under view of same, enlarged four diameters; *c*, female, enlarged two diameters; *d*, male abdomen, enlarged two diameters; *e*, female do.; *f*, hand of female; *g*, moveable finger of male.

Feejee and Samoan Islands.

Carapax rather strongly tuberculate, stout, greatest breadth hardly great as length excluding beak; beak at tip emarginate; posterior lateral tooth subacute, the two others bilobate; medial region with three small tubercles posteriorly, arranged triangularly; post-medial region with a small tubercle; intestinal uni-tuberculate: posterior margin of carapax not tuberculate or bearing a prominence. Abdomen of male very narrow, towards base suborbicular. Fingers of hand a little apart at base; the lower of *female*, denticulate along its whole inner margin, the upper near base bare in *female*, but having a broad tooth in *male*.

Length of male, eight and one half lines; greatest breadth, six lines. Length of female, seven lines; greatest breadth, five lines. Male a little more slender than the female, but otherwise similar, and not differing in the manner shown in the figures of Adams and White. The large tooth of the finger in the male was not observed in the female. Only four segments were distinguished in the female abdomen, as seen in figure 7 *e*.

In some specimens, the two anterior of the lateral teeth are very nearly simple, or scarcely bilobate. The beak, when broken at tip, as often happens in species of this genus, fails of course of showing the emargination. The outer antennæ in one of the specimens were

thrown forward beneath the beak, so as to be concealed by it, although capable of being spread either side of the beak. Arm of anterior legs with a few small tubercles.

*Menæthius subserratus*, ADAMS and WHITE, Crust. Samarang, p. 18, pl. 4, fig. 1.— Also fig. 2? which is supposed to represent a female.

MENÆTHIUS TUBERCULATUS, *Leach*.

Maris:—*Carapax valde tuberculatus posticè latiusculus (latitudine majore longitudinem carapacis post-rostralis æquante); dentibus lateralibus simplicibus, postico subacuto; regione medianâ posticè uni-tuberculatâ; regione post-medianâ obsoletâ, regione intestinali uni-tuberculatâ; margine postico utrinque prominulo; rostro longo, simplice. Abdomen perangustum, versus basin suborbiculare. Manus oblonga, digitis basin plane hiantibus.*

Male:—Carapax very strongly tuberculate, rather broad behind, (breadth equalling length of carapax excluding beak); lateral teeth simple, the posterior subacute; median region with but one tubercle on the posterior part; postmedial region obsolete; intestinal region uni-tuberculate; posterior margin of carapax with a small prominence near base of legs. Abdomen very narrow, towards base sub-orbicular. Hand oblong, fingers gaping, in contact only at apex.

Plate 5, fig. 1 *a*, animal (male), enlarged three diameters; *b*, under view, showing antennæ, enlarged six diameters; *c*, hand.

Paumotu Islands, Pacific Ocean.

Length, four lines; greatest breadth, two and two-thirds lines, which equals the length of post-rostral part of carapax.

The posterior part of carapax has the appearance of being orbicular in outline, owing to the fact that the sides along the lateral region, situated below the outline of the upper surface of the carapax, are in view when seen from above, as shown in the figure. Third joint of



the first pair of legs with a few minute tubercles, and a few similar tubercles usually on the same joint of other pairs, each tubercle bearing setæ.

*M. tuberculatus* (LEACH), ADAMS and WHITE, Crust. Samarang, p. 19.

#### MENÆTHIUS AREOLATUS.

*M. subserrato affinis.* Carapax paulo tuberculatus, tuberculo cardiaco simplice, quoque post-mediano intestinalique simplicibus; rostro integro, mediocri, margine laterali dentibus tribus, primo simplice, secundo paulo duplice. Oculi apice rotundati et spinâ anticâ alterâque posticâ instructi. Manus oblonga, superficie subtilissimè areolatâ, digitis plerumque contiguis, denticulis sex. Pedes 2di 1mis longiores.

Near *M. subserratus*. Carapax slightly tuberculate; cardiac tubercle simple, postmedian and intestinal also distinct and simple; second of the lateral teeth slightly double, the first and third simple; beak entire, of moderate length; lateral margin with three teeth; the first simple, the second a little double. Eyes rounded at apex, having at apex, both anteriorly and posteriorly, a small spine. Hand oblong, surface very minutely areolate, fingers for the most part contiguous, teeth six in number. Second pair of feet longer than the first.

Plate 5, fig. 2 *a*, beak and eye of male; *b*, teeth of lateral margin; *c*, hand.

Sooloo Sea.

Length, slightly over two lines.

The character of the eyes and the areolate character of the surface of the hands, as observed under a high magnifier, distinguish this species from the *subserratus*. The same areolate character is seen in the exterior maxillipeds, upon the other joints of the legs, and appears at first sight to be a granulation of the surface. Each minute areola appears to have a prominent point at centre, looking like an obsolete spine. The teeth of the fingers only extend along the apical half of the inner margin, the rest being very nearly a straight line.

## MENÆTHIUS INORNATUS.

*Carapax latus, latitudine trans-orbitali dimidio minore quam sive latitudo maxima sive longitudo post-rostralis, pone oculos non constrictus; marginibus lateralibus 3-dentatis, dentibus triangulatis subacutis; rostro brevi, integro; spinâ præorbitali latè triangulatâ; superficie dorsali paululum gibbosâ, regione cardiacâ simplicissimè tuberculatâ, medianâ tumidâ, vix subdivisâ, regione laterali fere planâ. Oculi parce salientes, apice bene truncati.*

Carapax broad, trans-orbital breadth half less than either the greatest breadth or post-rostral length, not constricted behind the eyes; lateral margins with three low triangular teeth, which are somewhat obtuse or subacute; beak short, entire; præorbital spine broad triangular; dorsal surface, but slightly gibbous, the cardiac region with a single simple tubercle, the median tumid and hardly subdivided into three parts, the lateral nearly flat, and not plicate. Eyes sparingly salient, truncate at apex.

Plate 5, fig. 3 *a*, male, enlarged three diameters; *b*, under view of head, six diameters; *c*, part of antennæ, right side; *d*, under view of eye; *d'*, upper view of extremity of eye.

Dredged at Lahaina, Hawaiian Islands.

Length, five lines; exclusive of beak, four lines; greatest breadth, four lines; trans-orbital breadth, two lines. The specimen examined was without legs. The carapax is peculiar in having its breadth across the eyes as great as half its post-rostral length; and also having no constriction behind the eyes, and in having few tubercles, and but very slight undulations on the lateral region. The lateral teeth, moreover, are nearly acute, and each is tipped with setæ. The apex of the third joint of the outer antennæ projects as far as the apex of beak, or even beyond it. The eyes are singular in their truncate character, and a slight tumidity at the anterior and posterior apex. The carapax rather abruptly declines back of a line that crosses by the cardiac tubercle.



## ACANTHONYX SIMPLEX.

Feminæ:—A. *Petiverii affinis*. Carapax parce convexus, tuberculis omnino carens, marginibus lateralibus parallelis, posterius cum dentibus duobus obsoletis ornatis, dente post-orbitali nullo. Pedes antiqui reliquis parce crassiores, digitis plerumque contiguis, 7–8-denticulatis, denticulis triangulatis, carpo supra cristato, subacuto; paris postici articulus penultimus angustior, angulo inferiore basi nec apici propinquiore. Tarsus 8–10 spinulis armatus.

Female:—Near *Petiverii*. Carapax sparingly convex, without a trace of tubercles; lateral margins parallel; no post-orbital tooth, but having posteriorly two obsolete teeth. Anterior feet sparingly stouter than the following; fingers contiguous, except near base; seven or eight triangular teeth; carpus cristate and subacute above. Angle on inferior side of penult joint of posterior legs nearer base than apex. Tarsus armed with eight to ten spinules.

Plate 5, fig. 4 *a*, female, enlarged two diameters; *b*, first pair; *c*, extremity of second pair; *d*, extremity of posterior pair.

Sandwich Islands.

Length of carapax, seven lines; width, five lines; breadth across the eyes, two lines. A very minute and sparse pubescence is seen, with a lens, on the legs, after the specimen is dry. The anterior angles of the carapax and the teeth posteriorly on the margin, seem, at first sight, to be prominent and acute; but this, as in other species, is owing to the setæ with which they are furnished. The distance between the two teeth referred to, is a little more than half the distance from the anterior of the two to the angle of the carapax. The spinules of the tarsus are less numerous and not as close as in the *Petiverii*, which species it resembles in its cristate carpus. The outer antennæ lie alongside of the beak, and do not project beyond the setæ at the apex of the beak. The abdomen of the female is broad elliptical, but larger and more nearly circular when with eggs beneath. In one specimen, possibly a different species, the carpus is not cristate.

The distance between the angle on under side of penult joint of legs and base of same joint, is about half the distance from the same angle to the apex; while in the *Petiverii*, this angle is nearer the apex than the base.

## ACANTHONYX DEBILIS.

Maris:—*Petiverii affinis*. *Carapax paulo convexus, marginibus lateralibus parallelis, regione medianâ obsoletè bi-tuberculatâ, tuberculis setigeris. Pedes antici maris reliquis vix crassiores, digitis parce hiantibus, carpo non cristato. Tarsus pedis postici 12–14 spinulis seriatim armatus; articulus penultimus latè triangulatus, infra obliquè truncatus.*

Near *Petiverii*. Carapax a little convex; lateral margins parallel; stomach region with two setigerous points. Anterior feet but little stouter than the following; fingers slightly gaping, and meeting only at the extremity; teeth triangular; carpus not cristate. Tarsus of posterior feet, with twelve to fourteen spinules in a row; penult joint broad triangular; truncate margin oblique.

Plate 5, fig. 5 *a*, hand of male, enlarged five diameters; *b*, extremity of posterior legs.

Valparaiso, Chili.

Length of carapax of male, nine lines; breadth, five and two-thirds lines; distance between first and second lateral teeth, two and one-eighth lines; distance between second and third lateral teeth, one and one-eighth lines.

Differs from the *Petiverii* in the small hands of the males, the teeth of the fingers, the cristate carpus, and the two obsolete tubercles on the stomach region; from the *lunulatus*, in the small hands in the males; from the *simplex*, in the stomach tubercles, the spinules of the tarsi. The abdomen has only six joints, and not seven, as in the *Mac Leayi* of Krauss; it has the same shape as in the *Petiverii* (Plate 5, fig. 6).



## ACANTHONYX PETIVERII?

Valparaiso, Chili.

Plate 5, fig. 6 *a*, hand of male, enlarged four diameters; *b*, extremity of second pair, enlarged five diameters; *c*, extremity of fifth pair, *ibid.*; *d*, abdomen of male.

The specimens agree with the description of the *Petiverii*. It is very near, also, the *Mac Leayi* of Krauss, but the male has only six segments to the abdomen. The two sides of the carapax are very nearly parallel, and the two posterior teeth of the margin are quite small, although appearing prominent through the setae. The hand of the male is very stout, the breadth being nearly equal to the length from the base to the fingers. The setigerous crest on the carpus of the anterior legs is distinct and prominent. The two setigerous tubercles on the stomach region are wanting.

The following are measurements of males:—Specimen A. Length of carapax, seven lines; breadth of carapax, four and a half lines; distance between the first and second lateral teeth, one and three-fourths lines; distance between the second and third, one line. Specimen B. Length of carapax, eleven and one-fourth lines; breadth of carapax, seven lines; distance between first and second lateral teeth, three and one-fourth lines; distance between second and third, one and one-half lines.

The tarsus in the eight posterior legs is oblong triangular. In the second pair, the two margins regularly and evenly diverge from the base, and the oblique truncation is very nearly transverse. In the fifth pair, the oblique truncation is more oblique; but the distance from the angle to the base of the joint is much the greater part of the joint, and the margin inside of this angle, that is, between it and the articulation of the tarsus, is far from parallel to the dorsal margin of the joint. The number of teeth in a row on the inner margin of the tarsus is about fourteen.

In the male hand, the fingers are a little open, and close entirely only at tip, and the inner margin has seven or eight broad teeth,

which are quadrate with a straight or truncate summit, but are scarcely at all prominent.

In the female the anterior feet are not stouter than the following. The fingers are denticulate, the teeth triangular and about seven in number. The penult joint of the posterior legs has the truncate margin more oblique; but the angle is rather nearer the apex than the base, and the number of teeth in a row on the tarsus is twelve to fourteen.

*Acanthonyx Petiverii*, EDW., Crust., i. 343.

GENUS PELTINIA, Dana.

*Epialto Acanthonyxique affinis.* Carapax latus, sublævis, depressus, rostro brevi complanato, bifido, latitudine transorbitali grandi, quam dimidium carapacis vix angustiore, dente præorbitali prominente, antero-laterali valde producto, postero-laterali parce prominente. Antennæ externæ rostro non celatæ, articulo primo angusto, apicem non denticulato. Oculi non retractiles, breves. Pedes 1mi 2dis breviores. Articulus 8 pedum posteriorum penultimus fere cylindricus infraque non gibbosus.

Carapax broad, depressed, smooth or nearly so; beak short, flat, bifid; transorbital breadth scarcely less than half that of carapax; præorbital tooth prominent; antero-lateral angle very much enlarged, and postero-lateral also slightly prominent; outer antennæ not concealed by the beak, first joint narrow, not dentate at apex. Eyes not retractile, short. First pair of feet shorter than second. Penult joint of eight posterior feet nearly cylindrical, not gibbous below.

This genus differs from *Epialtus* in having the front as in *Acanthonyx*, the outer antennæ being exposed alongside of the beak; and from *Acanthonyx*, in having the penult joint of the legs subcylindrical, and without a gibbous prominence for the tarsus to close against. Instead of this prominence, there is sometimes a small cluster of short setæ, and in other instances the setæ are wanting. It is near *Antilibinia*; but the breadth across the eyes is much greater, being nearly or quite half the greatest breadth of the carapax, while it is only a third in that genus.



## PELTINIA SCUTIFORMIS.

*Carapax subscutiformis, paulo oblongus, lævis, rostro vix longiore quam latiore, bilobato, angulis antico-lateralibus valde productis, setigeris, diametroque gastrico maximo, margine postero-laterali dentibus duobus obsolescentibus setigeris notato, regione medianâ bi-tuberculatâ. Antennæ externæ rostro valde longiores. Pedes tenuis, antici inermes, digitis contiguis.*

Subscutiform, a little oblong, smooth; beak hardly longer than broad, bilobate; carapax widest in a line across the stomach, antero-lateral angles much produced, setigerous, postero-lateral margin with two obsolescent setigerous teeth, medial region minutely bi-tuberculate. Outer antennæ projecting much beyond the beak. Feet slender; second pair longest; first pair unarmed, fingers contiguous.

Plate 5, fig. 7 *a*, male, enlarged six diameters; *b*, under view of head; *c*, hand.

Bay of Rio Janeiro.

Length, two lines. Colour ochreous yellow; legs flesh-red; a narrow longitudinal spot with rectilinear outline, near middle of back, having a light yellow colour; two setæ just anterior to this spot; one or more near middle of posterior margin, and another over the base of posterior legs. The surface of the carapax is somewhat flexuous. The carapax may be considered as consisting of three parts:—the rostral, the orbital, and the thoracic part. The rostral part of the carapax is about half as wide as the orbital, and the orbital a little more than half the width of the thoracic. A narrow transverse line between the two latter portions, had a light yellow colour, and the gradual slope between the two portions appeared, owing to this colour, to be an abrupt descent. The two minute tubercles of the medial region are situated just posterior to the line between these parts of the carapax. The beak is furnished with setæ.

The flagellum of the outer antennæ is not shorter than the two preceding basal joints. The male abdomen is narrow; from the

fourth joint it gradually narrows, and at apex it is rounded; above the fourth joint it is wider, and the margin either side is rounded.

PELTINIA NODULOSA.

*Carapax suboctagonus, parce oblongus, lævis, angulis duobus lateralibus utrinque productis, obtusis, rostri cornubus triangulatè sejunctis, triangulatis, subacutis; dente præorbitali subacuto, post-orbitali obsoleto, margine postico inermi. Pedes nudi, mediocres, articulis totis, manu tarsoque exceptis, plus minusve nodulosis, tarsis infra minute spinulosis. Antennæ externæ apicem rostri parce superantes.*

Suboctagonal, sparingly oblong, smooth, somewhat uneven, on either side two prominent angles which are obtuse; horns of beak triangular, and separated by a triangular interval, lamellar, subacute; præorbital tooth subacute, post-orbital obsolete. Posterior margin unarmed. Feet naked, of moderate length, second pair longest, all joints of legs, excepting the hand and the tarsi, nodulose, tarsi below spinulous. Outer antennæ extending slightly beyond apex of beak.

Plate 5, fig. 8 *a*, animal, enlarged; *b*, under view of head.

Coral reef of Vanua Lebu, Feejee Islands.

Length, one-fourth of an inch. Breadth between the eyes, about half the greatest breadth. The surface is finely granulated, and without tubercles or spines. The horns are short pubescent on inner side. The extremity of the eye alone, is visible in an upper view. The second and third basal joints of the outer antennæ are but little longer together than the first basal, and the apex of the third reaches only to base of beak; flagellum extends slightly beyond apex of beak. Buccal area nearly square. Last three pairs of legs subequal. Hand slender, oblong, curved a little at apex; fingers slender, in contact throughout their length.



## SUBFAMILY EPIALTINÆ.

## EPIALTUS BRASILIENSIS.

*Parvulus, subhexagonus, parce convexus, lævis, regione medianâ minutè bituberculatus, pone oculos dente parvulo appresso notatus; rostro fere equilateraliter triangulato, integro; lateribus angulatè salientibus angulis obtusis, longitudine post-orbitali latitudinem majorem æquante. Pedes sex postici breviores, articuli dente inferiore quinti juxta basin maximo. Abdomen maris 6-articulatum; feminae 5-articulatum, orbiculatum.*

Small, subhexagonal, sparingly convex, smooth, stomach region with two minute tubercles, a small close appressed tooth just behind the eyes; beak entire, nearly equilaterally triangular; sides angularly salient, angles obtuse, post-orbital length equalling greatest breadth. Six posterior feet shorter than others, tooth on lower side of fifth joint very prominent and proceeding from near the base of the joint. Abdomen of *male*, six-jointed; of *female*, five-jointed, orbicular.

Plate 6, fig. 1, male, enlarged three diameters.

Rio Janeiro, along sea-shore, among the sea-weed.

This species is very near the *bituberculatus* of Chili, and corresponds with the brief description of this species by Milne Edwards (Crust., i. 345). But his figure (Plate 15, fig. 11), represents a species of narrower proportions, and beak, and the very prominent tooth on the fifth joint is not given; the greatest breadth, instead of being equal to the distance from the posterior margin to the eyes, is shorter than this by very nearly the distance between the eyes and the tubercles. Moreover, the tooth on the margin behind the eyes, is not represented in the figure of the *bituberculatus*. The tubercles are almost obsolete in the *brasiliensis*, and the anterior angles of the carapax, posterior to the eyes, are short truncate.

EPIALTUS PRODUCTUS, *Randall*.

Puget's Sound, and Upper California.

Plate 6, fig. 2 *a*, female, natural size; *b*, abdomen.

This species has the exterior maxillipeds and the adjoining parts pubescent. The emargination of the beak is set with setæ, and other setæ tip the tooth anterior to the eyes, and the margin anterior to this tooth. There are also two series of curled setæ on the upper surface of the beak. The female abdomen is oblong elliptical. The last (seventh) segment is transverse triangular, abruptly a little narrower than the preceding, and the apex is obtuse. The cutting edges of the fingers are denticulate, with twelve to fifteen teeth. The breadth across the middle of the carapax, between the apices of the medio-lateral teeth, is equal to the distance from the posterior margin to a line between the eyes; and the breadth immediately anterior to these medio-lateral teeth, equals the distance from the posterior margin to a line between the antero-lateral teeth. The thoracic region bears two minute or obsolescent tubercles.

*E. productus*, J. W. RANDALL, Jour. Acad. Nat. Sci., viii. 110.

## HUENIA SIMPLEX.

*Maris*:—*Carapax lævis, valde elongatus, angustè subtriangularis, lateribus antero-lateralibus longis, anticè convergentibus, fere rectis et integris, in latera rostri rectè productis, dente præorbitali nullo; rostro oblongo, valde obtuso; angulo postero-laterali subacuto; margine postico integro; superficie 4-tuberculatâ (regione medianâ 3-tuberculatâ, cardiacâ 1-tuberculatâ). Pedes antici validi, manu crassâ, digitis latissimè hiantibus; articulus pedum 8 posticorum penultimus subcylindricus.*

*Male*:—Carapax smooth, much elongate, narrow subtriangular, having four low tubercles, antero-lateral sides long, converging forward nearly straight and entire, produced directly into the sides of the beak, no præorbital tooth; beak oblong, obtuse; postero-lateral



spine subacute, posterior margin entire, medial region with three tubercles, cardiac region with a single tubercle. Hand stout, fingers very widely apart except at tips, moveable finger with a single tooth near base; penult joint of eight posterior feet subcylindrical.

Plate 6, fig. 3 *a*, male, enlarged two diameters; *b*, side view of beak, *ibid.*; *c*, abdomen, *ibid.*

Sandwich Islands (Oahu or Maui).

Length, nine and a half lines; greatest breadth, six lines; part posterior to cardiac tubercle, about one-fourth as long as part anterior to the same. The absence of all teeth or spines on the sides, and the nearly straight line from the tip of the beak to the cardiac lateral spine, mark at once this species. The beak, or part anterior to the eyes, is longer than one-fourth the whole length of carapax. In a lateral view, the sides of the beak are seen to be excavate from just anterior to the eyes, and the front margin is rounded and entire.

#### HUENIA BREVIROSTRATA.

*Feminæ*:—*Carapax latus, paulo oblongus, breviter rostratus, utrinque 2-angulatus, angulis salientibus, lateribus inter angulos laterales valde excavatis; superficie carapacis breviter 4-tuberculatâ, rostro ad basin valde angustiore quam frons, acuto, non longiore quam latitudo trans-orbitalis, dente præorbituli vix saliente, obtuso. Manus tenuis, digitis versus basin paulo hiantibus, carpo inermi; articulus pedum 8 posteriorum penultimus subcylindricus.*

*Female*:—Carapax broad (a little longer than breadth), brevirostrate, two-angulate either side, the angles salient and separated by concave intervals; surface of carapax with four low tubercles; beak abruptly narrower than part of carapax posterior, acute and quite short; præorbital tooth, hardly salient, obtuse. Hand slender, fingers towards basin somewhat separate. Carpus unarmed. Penult joint of eight posterior feet subcylindrical.

Plate 6, fig. 4 *a*, female, enlarged two diameters; *b*, side view of anterior portion, *ibid.*; *c*, extremity of abdomen, *ibid.*

Sandwich Islands, Oahu or Maui.

Length of carapax, seven and one-half lines; greatest breadth, six lines; length of beak, hardly one line; part of carapax posterior to cardiac tubercle, about half as long as the part anterior.

In the outline of the carapax, there is a slight excavation marking the limit of the orbit; and the breadth of the beak at base is not over one-third the distance across in the line of the eyes. The large posterior lateral tooth or spine has anterior to it a slight swelling of the margin. In a lateral view of the head, the height in the line of the eyes is much longer than the beak. The beak in this view is slightly emarginate at apex.

LEUCIPPA LÆVIS.

*Carapax subtriangulatus, lævis, regione medianâ parce tumidâ, rostro elongato, furcato, cornubus triangulatis et triangulatè sejunctis, acutis; marginibus carapacis lateralibus pertenuibus, paulo expansis et sub-reflexis, 4-dentatis (aut angulatè undulatis), dentibus inæquis, dente posteriore posticè arcuato; margine laterali in superficiem regionis postero-lateralis producto. Regio pterygostomiana 3-dentata (aut instructa uno dente in sinu grandi insito). Pedes nudi, articulo 3tio cristato.*

Carapax subtriangular smooth, median region sparingly tumid; beak elongate, furcate, horns triangular, acute, and with a triangular interval; lateral margins of carapax very thin, and a little reflexed, four-toothed or angulately undulate, the teeth unequal, posterior tooth arcuate behind, and produced upon the postero-lateral surface of the carapax. Pterygostomian region three-toothed, or having a single tooth situated in a large depression. Feet naked, third joint cristate.

Plate 6, fig. 5 *a*, male, enlarged two diameters; *b*, under view; *c*, part of anterior legs.

From Rio Janeiro.

Length, four and a half lines; greatest breadth, three and a half lines.



This species might be embraced under the description of *Leucippa Ensenadae* of Milne Edwards and Lucas (D'Orbigny's S. America, Crust., p. 9, pl. 5, fig. 3); but the figure represents a species with different characters. The *Ensenadae* in this figure, has proportionally a shorter beak, with the two horns in contact and obtuse; the carapax is less perfectly triangular, and the several regions are much more pronounced. The lateral margin in the *lævis* is thin, slightly bending upward, and the teeth are notches in the thin margin, or subacute undulations in its outline, and not tubercles, "dont les trois postérieurs sont arrondis." The legs have a narrow crest or a trenehant edge. The outer edges of the basal joints of the outer antennæ are parallel or very nearly so, and not divergent backward as in the figure of the *Ensenadae*; and the beak is open at the furcation. The posterior lateral tooth of the carapax has the margin behind curving around, so as to terminate against the surface of the carapax.

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## II. PARTHENOPINEA.

THE PARTHENOPINEA, as stated on a preceding page, are intermediate between the Maia and Cancer groups, having the characters there mentioned. The anterior legs are usually the longest. The form may be transverse, or slightly oblong. The genus *Trichia* agrees nearly with *Parthenope* in the character of the orbit, the position of the base of the outer antennæ, and in many other characters; and although its anterior legs are but little longer than the following pairs, it evidently pertains to this group, being in some points intermediate between it and *Dromia*.

### LAMBRUS RHOMBICUS.

*Carapax non oblongus, rhombicus (fere quadratus), ad medium latior, posticè et lateraliter rotundatus, anticè triangulatus, pone oculos non constrictus, superficie superiore inæquali, tuberculis parvulis parce ornata, in regione laterali super basin pedum 2dorum tuberculo*

*prominente subacuto armatâ, et pone hunc tuberculum tuberculo altero minore. Rostrum apice pubescens; quoque carapacis quidam tuberculi pubescentes. Pedes antici margines hirsuti, manu trigonâ, marginibus salientibus, inæque dentatis, brachio marginem anticum minutè eroso et superficiem minutè spinuloso. Pedes 8 postici tenuissimi, breviter pubescentes.*

Carapax not oblong, rhombic in outline or nearly square, broadest at middle, behind and laterally rounded, anteriorly triangular, not narrowed behind the eyes, upper surface uneven, with small tubercles, over base of second pair of feet in branchial region a prominent subacute tubercle, and another smaller just posterior. Beak hairy at apex, also some of the tubercles of the carapax pubescent. Anterior feet with the margins hairy, hand trigonal, edges salient and unequally dentate, arm with the front margin minutely erose, as well as hairy, surface minutely spinulous. Eight posterior feet very slender, short pubescent.

Plate 6, fig. 7 *a*, animal, natural size; *b*, under view.

Feejee coral reefs, near Mathuata, island of Vanua Lebu; found under loose stones on the reef; not abundant.

Length, three-fourths of an inch. Carapax moderately convex. Tufts of hairs on some of the tubercles, at apex of beak and over the eyes. Obtuse triangular prominence on margin, a short distance behind the eyes. Setaceous portion of exterior antennæ not longer than last joint of base. Basal joints nearly equal. Some of the teeth of the hand obtuse, and others acute, edge hairy; carpus with a few minute spiniform tubercles.

#### LAMBRUS GRACILIS.

*Carapax paulo oblongus, subdeltoideus, posticè latior, anticè angustè elongatus, pone oculos constrictus; regione medianâ non tuberculatâ, cardiacâ unispinosâ et in eâdem lineâ transversâ spinulâ remotâ; rostro non latiore quam longiore, deflexo, obtuso, lateraliter prope medium angulato; marginibus carapacis lateralibus rotundato, utrinque 6-7-*



*denticulatis postico-lateralibus subito convergentibus, et posticè medio breviter bi-spinuloso. Pedes 8 postici gracillimi, læves, nudi. Pedes antici nudi, manu trigonâ, angulis inæqualiter spinoso-denticulatis, superficiebus lævibus, brachio marginibus spinoso-denticulato.*

Carapax a little oblong, subdeltoid, posteriorly broadest, anteriorly narrow and elongate, constricted behind the eyes, medial region not tuberculate, cardiac with one spine, and in same transverse line another remote spinule; beak not broader than long, deflexed, obtuse at apex, an angle either side near middle; lateral margins of carapax rounded and 6-7-toothed, the anterior tooth much the largest, postero-lateral margins rapidly convergent, and at middle behind, two short spines. Eight posterior feet very slender, smooth, naked. Anterior feet naked, hand elongate trigonal, angles unequally spinoso-denticulate, surfaces nearly or quite smooth, margins of arm spinoso-denticulate.

Plate 6, fig. 6 *a*, animal, enlarged three diameters; *b*, abdomen, enlarged six diameters.

Coral reefs of the island of Ovalau, Feejee Group.

Length, three lines.

The one spine of the cardiac region, and the one either side near the margin, are the only ones of the upper surface, except that anterior to the latter there is a range of minute obsolescent tubercles or spinules; outside of this range the sides of the carapax fall off rather rapidly. Either side of the two posterior spines of the carapax there is another smaller spine, besides some others still smaller. The abdomen of male is shown in figure *b*. Two of the teeth on the outer edge of the hands are more prominent than the others. The eight posterior feet are quite long and very slender, and without tubercles or spines.

This species has many of the characters of the *L. lamellifrons* of Adams and White (Voy. Samarang, p. 26, pl. 5, fig. 1). But in that species, the posterior legs, as represented by these authors, are much less slender and have small tubercles, and the form of the carapax is different in important points, although having a general resemblance.

GENUS CERATOCARCINUS (*Adams and White*).

In the species referred below to this genus, and resembling much that described by Adams and White, we observe the following generic characters :—

Outer antennæ free from the first basal joint, and cylindrical, inserted in a fissure in the under side of the orbit, and arising just anterior to the outer anterior angle of the buccal area; second basal joint much longer than first or third. Inner antennæ folded in shallow fossettes under the front very obliquely, making nearly an angle of  $50^\circ$  with the medial line. Buccal area nearly square. Front transverse, without a beak. Præorbital teeth salient beyond the line of the front. Eyes but little salient; orbit entire above. Carapax hexagonal in outline, the sides projecting triangulately, and nearly acute at the prominent angle. Abdomen of male seven-jointed. First pair of legs elongate, a little shorter than second; hand quite long, broadest at the commencement of the fingers.

## CERATOCARCINUS SPECIOSUS.

*Carapax hexagonus, fere equilateralis, depressus, regionibus partim conspicuis, fronte lato, rectè transverso, subtiliter crenulato, medium emarginato, utrinque juxta oculum valde saliente. Manus digitusque mobilis spinulosi; carpus parce spinulosus; digiti contigui. Pedes 8 postici breviter pubescentes, inermes.*

Carapax hexagonal, nearly equilateral, depressed, regions partly distinct; front broad, transverse, minutely crenulate and emarginate at middle; præorbital tooth salient, obtuse. Hand and moveable finger spinulous, carpus sparingly spinulous, fingers contiguous. Eight posterior feet short pubescent, not armed with teeth or spines.

Plate 6, fig. 8 *a*, male, enlarged; *b*, under view of head; *c*, male abdomen.



Taken from a Comatula brought up in twelve fathoms water, north of Viti Lebu, within the coral reefs.

Length, one and a half lines. Colour flesh-red, with two large hollow half moons marked transversely on carapax, the two placed in opposite positions, so that the convexity of the anterior is towards the front, and that of the posterior behind.

Antero-lateral margin concave and scabrous; lateral angle acute or nearly so. Third joint of exterior maxillipeds nearly square, breadth little greater than length. Flagellum of outer antennæ projects a little beyond apex of præorbital tooth. Eyes on short peduncles, and directed straight transversely, and in an upper view only the reticulate part is seen. A minute spine on anterior apex of peduncle.

CRYPTOPODIA FORNICATA (*Fabricius*).

Singapore.

*Male*.—Carapax broad subtriangular, arcuate behind, an angle in either lateral margin which is nearly a right angle; surface smooth, antero-lateral portion depressed, near middle a concave triangular area; beak small, broad triangulato-ovate subacute, faintly denticulate; posterior margin entire or nearly so; antero-lateral margin nearly straight, subsinuuous, irregularly denticulate. Hand somewhat three-sided, upper edge spinoso-dentate; arm widens behind towards apex, hinder margin denticulate, anterior margin erose and denticulate. Finger of hand with two spines above. Joints of eight posterior feet with an alate margin on upper side; third joint alate above and below, and also denticulate; tarsus styliiform, alate, acute. Abdomen minutely tuberculous.

Length of carapax, nine lines; greatest breadth, one inch and two lines; breadth of beak, one and three-fourths lines; length of beak, one and a half lines.

*Cancer fornicatus*, FABR., Ent. Syst., ii: 453.

*Cryptopodia fornicata*, EDW., Crust., i. 362.

EURYNOLAMBRUS AUSTRALIS (*Edwards and Lucas*).

Plate 6, fig. 9 *a*, animal (male), natural size; *b*, front view, enlarged two diameters; *c*, profile of a longitudinal medial section; A, the front extremity.

Bay of Islands, New Zealand.

The features of a human face are quite strongly marked on the carapax of this species, although in but faint relief. The form is broad triangular, with the lateral margin rounded but somewhat polygonal, and the general outline anteriorly, is approximately semi-circular. Where the polygonal margin terminates anteriorly, opposite the middle of the stomach region, there is a short fissure in the margin. The surface through its greater part is nearly horizontal: there is a broad shallow depression either side of a low stomach region; another depression posterior to the stomach region, somewhat uneven; and another much larger, upon the alate portion of the carapax either side of the cardiac region. In the middle of each of the anterior of these depressions, there is a rounded punctation, and posteriorly three others in a curving line, the last two being in the depression posterior to the stomach region; this curving line traced forward, would terminate in the short marginal fissure above alluded to. The front is declivous, and the anterior part of it quite abruptly so; the posterior part of the carapax is also declivous and slightly concave, and rounds laterally into the sides under the alate portion of the carapax. The frontal margin between the eyes consists of two small, rounded lobes; and outside of these, there is, on either side, a knob but little smaller, which is the extremity of the basal joint of the outer antennæ. It is separated from the lobes of the front by a small fissure from which the following joint proceeds.

The carapax has a minutely uneven or somewhat warty surface (between pitted and minute warty), especially around the frontal parts. Below, the carapax is very tumid either side anterior to the middle of the buccal region, and then follows a deep rounded concavity of large size. The surface of the exterior maxillipeds and abdomen is very closely and finely pitted.

The first joint of the outer antennæ is narrow in its apical half, but



widens much below on its outer side, and where this side terminates adjoining the orbits, there is a small fissure in the orbital margin. The second and third joints are small and nearly cylindrical. The flagellum is about fourteen-jointed. On the upper side of the orbit there is another small fissure, which furcates a short distance above and passes either side of a triangular piece, which is free at summit.

The anterior legs are wholly unarmed; the fingers are pointed and very finely and evenly denticulate. The hand and other joints have a pitted surface. The following legs are alate and angulate on the margins.

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## II. CRUSTACEA CANCROIDEA.

In the distribution of the Cancroidea, a division into two groups is obvious on the most superficial inspection,—the *swimming* and the *gressorial* species; and the subdivisions *Cancrinea* and *Portuninea* corresponding to this distinction, are those ordinarily adopted. These are the only groups of this grade adopted by Edwards or M'Leay.

Edwards arranges the genera under these divisions without any reference to their higher family relations, and makes for the Cancrinea the three groups,

- (1.) *Cryptopoda*, including *Æthrus*.
- (2.) *Arcuata*, including *Cancer*, *Xantho*, and the allied broad species.
- (3.) The *Quadrilaterales*, including the narrow or quadrate species *Eriphia*, *Trapezia* and *Melia*.

According to this arrangement, *Ruppellia*, which is closely allied to *Eriphia*, is placed in the second subdivision; and *Cancer*, which is peculiar in its longitudinal inner antennæ and narrow front, falls between *Etisus* and *Pilumnus*. The arrangement is in fact, simply such as is convenient for a determination of the genera, and not that based on natural affinities; and this appears to have been the object of its distinguished author.

M'Leay divides his "Cancerix" into three families,—

1. The *Xanthidæ*; carapax broad, with an arched front; inner branch of first maxillipeds dilated at apex.

2. *Canceridæ*; carapax broad, with an arched front; inner branch of first maxillipeds narrow at apex.

3. *Eriphidæ*; carapax subquadrilateral; inner branch of first maxillipeds narrow at apex.

The groups here indicated are of real importance. But the characteristics laid down do not affix to them their true limits. There are true *Xanthidæ* in which the inner branch of the first maxilliped is not dilated at apex; for there are those that have as narrow a carapax as any of the *Eriphidæ*, and a similar branch to the first maxillipeds. According to the characteristics mentioned, the *Eriphidæ* properly include *Pilumnus*; and not only *Pilumnus*, but also the narrow *Chlorodii*, some of which are nearly as narrow as long, and which are widely removed from *Pilumnus* in important characters. The distinctions of narrow and broad, happens in the family to be of little general value in classification, except when viewed under certain restrictions required by qualities of higher importance.

In the study of these species, there are actual difficulties in the way of arriving at natural subdivisions with conveniently circumscribed limits. The difficulties arise mostly from the fact, that no such limits exist as the systematist often looks for. Nature has made her fields without fences; and although there are some mountain ranges, in general, the blendings among the lower subdivisions in the kingdoms of life are by gentle gradations. The true object of classification, consists in tracing out gradations and inter-reticulations among groups. Keeping this in view, we shall not be dissatisfied if the groups laid down are found to shade into one another, instead of standing apart in bold relief. Such trenchant subdivisions are necessarily artificial, and although the simplicity with which they are characterized may gratify, they are to be looked upon with distrust, and generally as sure evidence that but a small portion of the field of study has actually been surveyed.

We have already (page 68), stated the reasons for including *Telphusa* and the allied genera with the *Cancer* group; and have alluded also in the same place, to the relations of *Acanthocyclus* to this group. The *Telphusa* family are fresh-water *Cancroids*, and mark the transition to the *Grapsoidea*; while the *Acanthocyclus* is related to the *Corystoidea*. We are thus led to arrange the *Cancroidea* in three



grand divisions; one of which may be called the *typical*, another the *Grapsoid*, and the third the *Corystoid* division, as follows:—

Legio I. CANCRINEA, or Cancroidea typica.

Legio II. TELPHUSINEA, or Cancroidea Grapsidica.

Legio III. CYCLINEA, or Cancroidea Corystidica.

The second and third divisions contain but few genera. The first includes several families and subfamilies, based on important characteristics.

The structure of the efferent canal leading from the branchial cavity, as already explained, has a high value in classification. By means of it, the Leucosoidea are separated from all other Brachyura; the distinction has been shown to be wide, and to attend striking characteristics of other kinds. The inner branch of the first pair of maxillipeds undergoes a corresponding modification, and, therefore, becomes itself important as a means of distinction.

Among the Cancroidea, there are peculiarities of a somewhat analogous kind. Although the efferent passage covers uniformly the outer part of the prælabial plate or palate, it is in some species found with better defined limits than in others. In a large number of genera, there is no separation from the rest of the prælabial surface; but in other genera there is a longitudinal ridge, giving this canal distinct bounds. This ridge is very perfectly developed in *Eriphia*, and the narrow inner branch of the first maxillipeds covers the canal as in the Leucosoidea. It is equally complete or nearly so, in *Ruppellia*, *Cæthrus*, *Ozius*, a genus separated from *Xantho* on this ground, and in several other genera. It is distinct also in *Pilumnus*. But in *Cancer*, *Xantho*, and many of the ordinary genera, there is no such ridge, or if traces of it exist (as in *Pseudocarcinus Rumphii*, some *Carpilii* and others), it is short, and does not extend to the front margin of the palate. This character affords therefore a natural division among the Cancroidea, though not the sole character at the basis of a natural classification.

The natatory character of the posterior legs is another important characteristic.

Moreover, among the natatory species, De Haan has pointed out a character of much value: that in many of them the inner branch of the outer maxillipeds has a small lobe attached to the inner margin, which lobe is wanting in the rest of the swimming species, and in all

the non-swimming Cancroidea. The true value of this peculiarity in classification, has been remarked upon on pages 71, 72.

With these characters in view, we distribute the Cancroidea as follows:—

LEGIO I. CANCRINEA, *vel* CANCROIDEA TYPICA.

1. *Pedes postici gressorii.*

Fam. I. CANCRIDÆ.—Palatum colliculo utrinque non bene divisum. Carapax sæpius late transversus, interdum angustus.

Fam. II. ERIPHIDÆ.—Palatum colliculo utrinque bene divisum. Carapax sæpius angustus, interdum latus, margine antero-laterali raro longiore quam postero-lateralis, latitudine ante-medianâ sæpissime longiore, oculis remotis.

2. *Pedes postici natatorii.*

Fam. III. PORTUNIDÆ.—Ramus maxillipedis 1mi internus lobo interno instructus. Palatum sæpius colliculo utrinque divisum.

Fam. IV. PLATYONYCHIDÆ.—Ramus maxillipedis 1mi internus non lobatus. Palatum colliculis non divisum.

LEGIO II. TELPHUSINEA, *vel* CANCROIDEA GRAPSIDICA.

Fam. I. TELPHUSIDÆ.

LEGIO III. CYCLINEA, *vel* CANCROIDEA CORYSTIDICA.

Fam. I. ACANTHOCYCLIDÆ.

In all the species, excepting some Eriphidæ, the orbit has a hiatus at the inner side, which is occupied wholly or in part by the base of the outer antennæ, or a process from it. The portion of the Eriphidæ alluded to (the subfamily *Eriphinæ*), are, in fact, the only examples among the Brachyura in which the orbit is entirely enclosed by the shell, so as to exclude wholly the base of these antennæ from forming any part of the circuit. *Ruppellia* and *Eriphia* are hence related in a character of prominent importance; and the former of these genera



as thus characterized, is widely different from Eudora of De Haan, although both include the same species as type; for Eudora is so described and used by its author, as to embrace, also, other species having the orbit of Xantho.

The importance of making the ridge bounding the efferent passage a distinguishing family characteristic, instead of mere form or width of carapax, is abundantly illustrated among the species. From Xantho, the transition, in general form and other characters, is very gradual to Xanthodes, another genus of Cancridæ, so gradual indeed, that only a slight difference in an antennary joint separates the genera; and the latter genus, includes species having the narrow form common among the Eriphidæ. Through the genus Chlorodius, there is the same passage to closely-related species having a narrow Eriphioid or Pilumnoid form; and Cyclodius, which is identical with Chlorodius, except in having a triangular form to the third joint of the outer maxillipeds, has nearly an orbicular form, while Cymo, is still more nearly orbicular, the breadth equalling the length. Such narrow species might be supposed, from the form, to be related to Pilumnus and Pilumnoides; yet the latter are distinguished by the ridge on the palate. Even the narrow Cymo has not this ridge, while in Pilumnoides and Actumnus it is very prominent.

The Platyonychidæ, although without the palate ridges, are narrow species, with the antero-lateral margin shorter than the postero-lateral, as in the Eriphidæ. In the palate and outer maxillipeds, they are related to Cancer and Perimela on one side, and also to the Corystoidea on the other.

Although the CYCLINEA have but *five* branchiæ in the exterior of the branchial pyramid, this does not seem necessarily to exclude these from the Cancroidea; for the Grapsoids admit of a like variation, the number being at times as great as in the Cancroids. They are related to the Corystoids, as explained, in being a low grade of Cancroids, rather than in having the prominent characteristic of the Corystoids. The inner antennæ in Corystoides, a genus near Acanthocyclus, have no fossettes, and this is an example of a still lower state of degradation Anomoural in character.\*

The genus Cymo has the circular outline of Acanthocyclus. But the number of branchiæ in the exterior of the branchial pyramid is

\* See page 54.

*seven*, the full Cancroid number, and other characters are as in the Chlorodinæ.

The conflict between the genera of Edwards and De Haan has been alluded to, and the difficulty of adopting all those of the latter without also using his system. The case of *Eudora* and *Ruppellia* has been mentioned. In this and other similar instances, we are forced to retain Edwards's generic name, if we retain his genus as to limits. Moreover, we see no reason for substituting De Haan's *Ægle* in place of *Zozymus* of Leach, any more than his *Chlorodius* for *Atelecyclus* of Leach, or *Anisopus* for *Platyonychus* of Latreille.

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## I. CANCRINEA, OR CANCROIDEA TYPICA.

### FAMILY I. CANCRIDÆ.

*Pedes postici gressorii. Palatum colliculo ad marginem anticum producto non bene divisum.*

Posterior feet gressorial. Palate not divided either side of middle by a longitudinal ridge reaching to its anterior margin.

The genera of Cancridæ are naturally arranged into a series of groups or subfamilies, based partly upon the inner antennæ,—the relation of the base of the outer antennæ to the orbits,—the character of the fingers, whether pointed, or excavated spoon-like. The following synopsis includes these subfamilies, and the known genera pertaining to them, with their characteristics. It is a general fact with regard to the species, that the antero-lateral margin is longer than the postero-lateral, which is not true of the Eriphidæ. There are some few exceptions, however, as in the genera *Liagora*, *Menippe*, and *Panopæus*.

1. CANCRINÆ. — Antennæ internæ plus minusve longitudinales. Frons interorbitalis perangustus. Digiti acuminati.



- G. 1. *CANCER*, *Leach*.—Pars antennæ externæ mobilis hiatu orbitæ omnino exclusa. Carapax latissimus.
- G. 2. *PERIMELA*, *Leach*.—Pars antennæ externæ mobilis hiatu orbitæ non exclusa. Carapax perangustus.
2. *XANTHINÆ*.—Antennæ internæ plus minusve transversæ. Antennæ externæ basi firmè infixæ, parte mobili hiatu orbitæ non exclusâ. Frons interorbitalis latior. Digiti acuminati.

1. *Regio carapacis postica convexa. Orbita hiatu externo non interrupta.*

- G. 1. *ATERGATIS*, *De Haan*.—Margo antero-lateralis postero-laterali longior. Pedes 8 postici compressi, cristati.
- G. 2. *CARPILIUS*, *Leach, De Haan*.—Margo antero-lateralis postero-laterali longior. Frons sæpissime bene 4-lobatus. Ramus maxillipedis 1mi internus lobato-furcatus. Pedes 8 postici nudi, subcylindrici, non cristati.
- G. 3. *LIOMERA*, *Dana*.—Frons leviter 2-lobatus aut rectiusculus. Margo antero-lateralis postero-laterali non brevior. Ramus maxillipedis 1mi internus non lobatus. Pedes 8 postici nudi, subcylindrici, non cristati.
- G. 4. *LIAGORA*, *De Haan*.—Margo antero-lateralis postero-laterali brevior. Frons leviter 2-lobatus aut rectiusculus. Pedes nudi, tarsi exceptis. Ramus maxillipedis 1mi internus non lobatus.

2. *Regio carapacis postica transversim non convexa.*

a. *Carapax versus margines frontalem antero-lateralemque curvatim declivis.*

- G. 5. *ACTÆA*, *De Haan, Dana*.—Margo postero-lateralis brevis, sæpius concavus. Orbita hiatu externo non interrupta.

b. *Carapax versus margines frontalem antero-lateralemque parce declivis.*

a. *Orbita hiatu externo non interrupta.*

- G. 6. *XANTHO*, *Leach*.—Margo antero-lateralis postero-laterali longior. Articulus antennæ externæ 1mus oblongus, frontem bene attingens, articulo sequente e apicis medio articuli 1mi orto.
- G. 7. *EUXANTHUS*, *Dana*.—*Xantho* formâ similis: articulus antennæ externæ 1mus hiatum ad summum implens, articulo sequente e latere excavato apicis orto.
- G. 8. *XANTHODES*, *Dana*.—*Xantho* formâ similis: carapax depressus, ad latera non dilatatus. Articulus antennæ externæ 1mus abbreviatus, processum frontis oblongum attingens tantum. Abdomen *maris* 5-articulatum.
- G. 9. *PARAXANTHUS*, *Lucas*.—*Xantho* formâ fere similis: carapax depressus, fronte productus, ad latera dilatatus. Articulus antennæ externæ 1mus abbreviatus. Abdomen *maris* angustum, 5-articulatum.
- G. 10. *MENIPPE*, *De Haan*.—Margo antero-lateralis postero-laterali brevior. Articulus antennæ externæ brevis nec frontem nec frontis processum attingens. Abdomen *maris* 7-articulatum.

*β. Orbita hiatu externo interrupta, infra integra.*

G. 11. PANOPÆUS, *Edwards*.—Margo antero-lateralis tenuis, postero-laterali sæpius brevior, ad orbitæ angulum externum directus.

*γ. Orbita infra extusque tribus dentibus instructa, uno externo, duobus inferioribus.*

G. 12. MEDÆUS, *Dana*.—Angustus, paulo transversus, nudus, fronte sat brevi. Margo antero-lateralis sub orbitâ productus. Abdomen *maris* 5-articulatum, segmento ultimo brevi. Pedes antici crassi, iis *Xanthi* similes.

G. 13. HALIMEDE, *De Haan*.—Angustus, parce transversus, fronte brevior. Abdomen *maris* 7-articulatum, segmento ultimo valde elongato. Pedes antici crassi, iis *Xanthi* similes.—An *Pilumnis* propinquior?

3. CHLORODINÆ.—Antennæ internæ transversæ. Antennæ externæ basi firmè infixæ, parte mobili hiatu orbitæ raro exclusâ. Frons interorbitalis latior. Digi instar cochlearis excavati.—[Quoad genera, *Xanthinæ* et *Chlorodinæ* ferme parallelæ.]

1. *Hiatus orbitæ internus processu basis antennæ externæ occupatus, articulum 2dum occludens.*

G. 1. ETISUS, *Leach*.

2. *Hiatus orbitæ internus basi antennæ externæ occupatus, articulo 2do non ocluso.*

## 1. Regio carapacis postica convexa.

G. 2. CARPILODES, *Dana*.—Carapax latus, nudus, margine antero-laterali crassè rotundato. Pedes 8 postici subcylindrici, nudi. *Liomeræ* habitu similis.

G. 3. ZOZYMUS, *Leach*.—Carapax mediocriter latus, margine antero-laterali tenui. Pedes 8 postici valde compressi, cristati aut subcristati. *Atergati* habitu similis.

## 2. Regio carapacis postica fere plana.

*a. Carapax versus margines frontalem antero-lateralemque curvatim declivis.*

G. 4. ACTÆODES, *Dana*.—Pedes 8 postici non cristati. *Actææ* aspectu similis. Articulus maxillipedis externi 3tius apicem vix excavatus.

G. 5. DAÏRA, *De Haan*.—Pedes 8 postici non cristati. Articulus maxillipedis externi 3tius apice valde emarginatus.

*b. Carapax versus margines frontalem antero-lateralemque vix declivis.*

G. 6. CHLORODIUS, *Leach*.—Carapax plus minusve transversus. Articulus antennæ externæ 1mus oblongus frontem bene attingens. Articulus maxillipedis externi 3tius subrectangulatus. *Xantho* aspectu similis.

G. 7. PILODIUS, *Dana*.—Carapax paulo transversus. Articulus antennæ externæ abbreviatus, processum frontis oblongum attingens tantum. *Xanthodi* aspectu similis.



G. 8. CYCLODIUS, *Dana*.—Carapax parce transversus. Articulus antennæ externæ oblongus frontem bene attingens. Articulus maxillipedis externi 3tius triangulatus, latere interiore brevissimo.

G. 9. CYMO, *De Haan*.—Carapax non transversus, fere orbiculatus, disciformis. Antennis *Chlorodio* affinis.

4. POLYDECTINÆ.—Antennæ internæ transversæ. Antennæ externæ basi solutæ, liberæ.—An *Pilumnis* propinquior?

G. POLYDECTUS, *Edw.*—Orbita dentibus tribus infra instructa. Manus elongata, digitis prælongis, attenuatis, uncinatis, cum dentibus tenuiter spinuliformibus sæpe armatis.

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SUBFAMILY I. CANCRINÆ.

*Antennæ internæ plus minusve longitudinales. Frons interorbitalis perangustus.*

Inner antennæ more or less longitudinal. Inter-orbital front very narrow; and median region somewhat narrower than the breadth of the carapax across the orbits.

The Cancrinæ, unlike the other families of this division, have the inner antennæ longitudinal, and this is connected with a narrow interval between the orbits. This inter-orbital distance in Cancer is, at times, less than one-tenth of the whole breadth of the carapax, and is seldom greater than one-eighth. The singularity of this ratio is evident, when we consider that in the other Cancridæ, it varies from one-sixth to one-half, and is usually one-fourth. The median region, although broader anteriorly than the breadth across the orbits, is seldom one-third as broad as the carapax. The narrowness of the inter-orbital space accounts for the inner antennæ being longitudinal.

The carapax is convex, with the lateral portions often somewhat dilated. The buccal area is usually longer than broad; and the third joint is commonly a little oblong, and at times projects forward somewhat beyond the limits of the buccal area; the epistome is very short, and sometimes obsolete. The second joint of the outer maxillipeds

have the inner margins parallel, but the sulcus near the margin is not parallel to the margin, the two sulci diverging posteriorly.

This family is closely related to the Corystoidea, and forms one of the connecting links between that group and the Cancroidea; the outer maxillipeds in Cancer and Perimela in projecting over the epistome, approach those of Corystes and Atelecyclus, and the narrow form of Perimela has led to its reference in some systems to that group. Through Perimela there is also a transition to Polybius and other genera of Portunidæ, in which the outer maxillipeds have a like character, and the general form is also similar. In general outline and convex form the species of Lupa are related to those of Cancer, and our genus Arenæus fails in the prelabial ridge, and thus approximates quite closely to that group.

#### GENUS I. CANCER (*Leach*).

In addition to the remarks already made on this genus, we observe that the postero-lateral margin is very oblique inward, approximating sometimes to transverse. The regions are indicated by undulations of the surface, and not by trenchant sulci. The area either side of the anterior part of the median region is often somewhat concave.

The outer antennæ have a very broad basal joint, which sets down upon the anterior margin of the buccal area, or with only a very short intervening space; and the two leave between them a narrow interval which is occupied by the inner antennæ. The whole breadth occupied by the pair of outer antennæ is less than the breadth of the buccal area. The following joints proceed from the inner side of the basal joint. There is a tooth adjoining the orbit, and three between the outer antennæ, the medial of the three largest. In one species the lobes are nearly equal crenatures of the margin.

*Platycarcinus*, M. EDWARDS, Crust., i. p. 412.

#### CANCER MAGISTER.

*Carapax nudus, granulatus, paulo convexus, superficie paulo undulatâ, lateraliter triangulatus et acutus, margine postero-laterali fere recto, an-*



*tero-laterali 10-dentato, dentibus paululo prominentibus, margine utriusque postero longissimo et fere recto, subtiliter crenulato, dente postremo triangulato; fronte inter-antennali tri-dentato; articulo antenarum externarum primo apicem crassè producto. Pedes antici subæqui, manu supra cristatâ, multi-dentatâ, extus costatâ, digito mobili supra denticulato. Pedes 8 postici valde compressi, tarso paulo lato, articulis supra granulatis, quarto supra canaliculato, tarso articuloque quinto pedis quinti infra bene ciliatis. Articulus maxillipedis externi tertius oblongus, apicem externum obliquè truncatus.*

Carapax naked, granulate, a little convex, surface somewhat undulate, laterally triangulate, acute, postero-lateral margin nearly straight, antero-lateral ten-toothed, teeth slightly prominent, hinder margin of each very long, and almost straight, and finely crenulate, last tooth triangular; inter-antennary front three-toothed. First joint of outer antennæ stoutly produced at apex. Anterior feet subequal; hand above cristate and many-toothed, exterior surface costate, moveable finger above denticulate. Eight posterior feet much compressed, tarsus a little broad, joints granulate above, fourth canaliculate above; tarsus and preceding joint of fifth pair prominently ciliate below. Third joint of outer maxillipeds oblong, obliquely truncate at outer apex.

Plate 7, fig. 1 *a*, carapax, natural size; *b*, part of outer maxilliped; *c*, hand of small specimen (male), enlarged two diameters; *d*, extremity of posterior legs, enlarged two diameters.

Bay of San Francisco, C. Pickering, Exp. Exp.

Length of carapax, four and three-fourths inches; greatest breadth, seven inches; ratio 1 : 1.47. The areolets are but faintly marked, yet the surface is undulate. 2 M is scarcely at all prominent above the surface either side. In a small specimen the length is thirteen lines; greatest breadth, nineteen lines; ratio, 1 : 1.46. The characters of the anterior legs and the tarsi of the posterior legs are taken from this small specimen. The flattened tarsi and the long ciliation of the inner margin of this and the preceding joint, is a striking character. The outer margin of the third joint of the outer maxillipeds is not long ciliate as in the *C. gracilis*.

## CANCER GRACILIS.

*Carapax nudus, partim minute granulatus, valde convexus, non distinctè areolatus, superficie non undulatâ, lateraliter triangulatus et acutus, margine postero-laterali fere recto, antero-laterali 9-dentato, dentibus regularibus, acutis, paulo prominentibus, dente primo vix longiore quam secundus, totis margine postero fere rectis et longis et subtiliter denticulatis; fronte inter-antennali tridentato. Maxillipedes externi pubescentes, articulo tertio apicem externum valde arcuato aut rotundato, marginem apicalem et externum longè ciliato. Pedes antici subæqui, manu subcristatâ, cristâ 1-2-dentatâ, superficie externâ costatâ. Pedes 8 postici nudi, tarso longo, tenuissimo, nudo.*

Carapax nude, in part minutely granulate, much convex, not distinctly areolate, surface not undulate, laterally triangulate and acute, postero-lateral margin nearly straight, antero-lateral nine-toothed, teeth regular, acute, a little prominent, first tooth hardly longer than second, all with the hinder side nearly straight, long and minutely denticulate; inter-antennary front three-toothed. Outer maxillipeds pubescent, third joint at outer apex arcuate or rounded. Apical and outer margin long ciliate. Anterior feet subequal; hand subcristate, crest 1-2-dentate, outer margin costate. Eight posterior feet nude, tarsus long, very slender and naked.

Plate 7, fig. 2 *a*, male, natural size; *b*, outer maxilliped; *c*, outer view of hand, natural size; *d*, abdomen, natural size.

San Francisco.

Length of carapax, thirteen lines; greatest breadth, nineteen lines; ratio, 1 : 1.46. This species is very similar to the large one from San Francisco. But the different shape of the outer maxillipeds is sufficient evidence of their difference of species.

CANCER EDWARDSII (*Bell*).

Ophthalmic breadth not greater than medial region, outline in front hardly projecting at all beyond line of orbits.



Valparaiso; also Illawarra, New South Wales?

This large species is well described and figured by Bell (Trans. Zool. Soc., i. 335). The ratio of length to greatest breadth of carapax in two females, 1:45 and 1:1.5. The colour of a living specimen, four inches in breadth, was deep reddish brown, the legs inclining towards purple. The third joint of the eight posterior legs in the same specimen has a line of short hairs along its upper edge, and the pterygostomian region is pubescent. The regions and areolets are faintly apparent. The frontal region is very short; 1 M and 2 M are not separate, and together they form a slightly-swelling prominence either side of the medial line; 3 M is also distinct, but is hardly separate from 4 M, which is rather large; two minute punctations mark the limits between them. 5 L, 6 L are also distinct, although not shown in Bell's figure, and barely distinguishable in the largest specimens, such as afforded his description. 1 P is nearly rhombic approaching quadrate. The antero-lateral margin is unevenly dentate; but the teeth pertain to ten broad and short lobes. Of these lobes the ninth is S, or the fifth normal tooth; and the carapax has its greatest breadth as usual, in this line. The fourth normal (T), corresponds to the eighth, seventh, and sixth lobes; the third normal (N), to the fifth and fourth; the second normal (E), to the third and second; and the first (D), to the first or orbital tooth. The dentations on the margin of the lobes are fewest and much the largest on the largest individuals. The peduncle of the eyes is continued upward on one side to the tip nearly, where it terminates in a low point.

The Illawarra specimen is only a carapax; but shows all the characters of the *Edwardsii* both in its surface and the marginal teeth. The limit of the posterior tooth (or tenth), is scarcely observable from above, but is apparent on the under side. The length is one and three-fourths inches; greatest breadth, one and two-thirds inches; ratio of length to breadth, 1:1.5. The granulation of the surface is precisely of the same character as in the *Edwardsii*, and the eyes are tipped in the same manner. The marginal dentation is smaller, but this appears to be due to the smaller size of the specimen. This is the Cancer Novi-Zelandiæ of A. White (Crust., Erebus and Terror, Plate 1, fig. 5).

CANCER DENTATUS (*Bell*).

Valparaiso.

Length of carapax of a male, in this hairy species, two inches; greatest breadth, two and seven-eighths inches; making the ratio of length to breadth 1:1.44. The figure by Bell affords the ratio 1:1.57. In his figure, the sides of the carapax are not as broadly rounded as in our specimens; which hardly make an approach to an angle at the last of the prominent teeth. The medial region is distinct in its outline, and 3 M and 2 M separate. The antero-lateral region has imperfectly the usual areolation, 5 L and 6 L being faintly separate, and 2 L also somewhat distinct. The ten triangular teeth of the margin appear to correspond,—the first to D; the second and third to E; the fourth and fifth to N; the sixth, seventh, and eighth to T; the ninth to S; and the tenth is a posterior tooth. The areola 1 P is somewhat rhombic, a little oblong, and well defined.

*Cancer dentatus*, BELL, Zool. Trans., i. 339, pl. xlv., 1835.

*Cancer polyodon*, PÆPPIG, Wieg. Arch., 1836, p. 133.

CANCER PLEBEIUS, *Pæppig*.

Valparaiso.

Length of carapax of one specimen (male), two and three-fourths inches; greatest breadth, four and five-eighths inches; ratio of length to breadth, 1:1.67. A young male gave for the length, 8.1 lines; breadth, thirteen lines; ratio of length to breadth, 1:1.6. The regions are mostly indistinct, but may be partly distinguished; Bell's figure fails of representing what actually appear. They are in general very nearly as in the *Edwardsii*, and the ten lobes of the antero-lateral margin have the same relations.

The *Cancer irroratus* of Say is recognised by Dr. A. A. Gould as a distinct species from the *C. irroratus* of Bell, in his Report on the Invertebrata of Massachusetts, 1841, and is named *Cancer Sayi*. But



as the Valparaiso species was first made distinct from the other species by Pœppig, his name is adopted above.

*Cancer irroratus*, BELL, Zool. Trans., i. 340, 1835.

*Cancer plebeius*, PŒPPIG, Wieg. Archiv., 1836, p. 134.

#### CANCER PRODUCTUS (*Randall*):

Plate 7, fig. 3 *a*, animal, natural size; *b*, under view of head; *c*, outer view of hand of right side; *d*, abdomen; *e*, outline of part of front of a large specimen, natural size; *f*, outer maxilliped of same; *f'*, part of fouette; *g*, second pair of maxillipeds; *h*, first pair of maxillipeds.

Puget's Sound, N. W. America, C. Pickering. Exp. Exp.

Length of carapax, thirteen lines; greatest breadth, twenty lines; and ratio of length to breadth, 1 : 1.54. The carapax is faintly areolate in part, and has a broad shallow depression either side of the areolet 2 M. The front is slightly areolate in outline, and is very evenly crenate with five nearly equal low crenatures. The antero-lateral margin has nine teeth, with none posterior to S, though there is a slight emargination; the transverse line connecting the two posterior of the teeth, is twice as far from the front as from the hinder margin of the carapax. The teeth are very even, though low or like lobes, and increase in size rather regularly from the second to the posterior, and at the bottom of the interval, between each there is a short suture marked on the carapax. The postero-lateral margin is concave and short. The hand is cristate; above, the surface is small tuberculous, externally it is somewhat carinate. The posterior legs are naked excepting the tarsus. The outer maxillipeds have the inner angle of the third joint rounded, with an acute emargination below it.

The first joint of the outer antennæ is thin and oblong, with the sides nearly parallel, and the summit somewhat truncate; it reaches as far forward as the edge of the front.

The furrow on the second joint of the outer maxilliped is placed obliquely as in the Cancers, and not parallel to the margin as in most of the Xanthinæ, &c.

A large specimen from Puget's Sound, appearing to be the same species (figs. *e, f, g, h*), is much more convex, the front more deeply crenate, and the margin thicker and more deeply dentate. The posterior lateral teeth are not quite so far back as in the *productus*, being in the line with the median punctures, and not posterior to them. It has similar outer maxillipeds, and excepting the characters just mentioned is like the *productus*. Length of carapax, two inches and five lines; breadth, three inches and nine lines; ratio 1 : 1.55.

*Cancer productus*, J. W. RANDALL, Journ. Acad. Nat. Sci. Philad., viii. 116.

#### SUBFAMILY XANTHINÆ.

In the Xanthinæ, the distance between the orbits is seldom less than one-sixth of the breadth of the carapax, and is sometimes more than one-half; one-fourth is nearer the common ratio. The antero-lateral margin is usually longer than the postero-lateral; though somewhat less in species of *Panopæus*, *Menippe*, and *Liagora*. The third joint of the outer maxillipeds is seldom oblong, and never projects beyond the proper limit of the buccal area; its anterior margin is commonly truncate, either somewhat obliquely or transverse, and it is either arcuate in outline or slightly excavate, with occasionally a well-marked emargination. But the joint is occasionally oblong, the apex being produced and oblique at its terminal margin.

#### GENUS ATERGATIS, *De Haan*.

The genus *Atergatis* of De Haan (*Faun. Japon.*, 17, 1833) corresponds to *Cancer* of Edwards (*Crust.*, i. 372, 1834), and *Platypodia* of Bell (*Zool. Trans.*, i. 335, 1835). Each of these authors characterizes it as having the eight posterior legs of the species *cristate*.

#### ATERGATIS LIMBATUS.

From the Feejee Islands; also from the Sooloo Sea.

Length of carapax of a male, 1.05 inches; greatest breadth 1.55 inches; ratio of length to breadth, 1 : 1.47. In another male, length,



0·94 of an inch; breadth, 1·38 inches; ratio, 1 : 1·46. The granulations of the surface are somewhat elongated on the antero-lateral region. The areolets are distinct. 2 F is narrow; 1 M is nearly quadrate and distinct from 2 M; 2 M is divided longitudinally; 5 L, 6 L are hardly separate and coalesce nearly with 4 L; 3 L, 2 L, 1 L are distinct. The posterior region is flat without subdivisions. The eight posterior legs are very prominently crested, and the outer surface is granulous, as figured by Rüppell. The lateral outline of the carapax is nearly regularly rounded, there being but a slight angle where the border terminates.

*Xantho granulatus*, RUPPELL, Krabben des rothen Meeres, 24, pl. 5, f. 3.

*Ægle granulatus*, DE HAAN, Faun. Japon., 17.

*Cancer limbatus*, EDWARDS, Crust., i. 377, pl. 16, f. 1.

#### ATERGATIS MARGINATUS (*Rüppell*), *De Haan*.

From the Sooloo Sea.

The specimen is a small one, of a reddish colour, with a white, entire border. Length of carapax, nine and a half lines; greatest breadth, fourteen and a half lines; ratio of length to breadth, 1 : 1·53. The fingers are quite short, and the hands are very nearly equal. The tarsus has a few hairs below, and there is a short tuft on the angle of the lower margin of the preceding joint.

*Carpilius marginatus*, RUPPELL, Krabben des rothen Meeres, p. 15, pl. 3, f. 4.

*Cancer marginatus*, EDWARDS, Crust., i. 375.

*Atergatis marginatus*, DE HAAN, Crust. Faun. Japon; KRAUSS, Südaf. Crust., p. 28.

#### ATERGATIS INTEGERRIMUS, *Lamk*.

East Indies.

Length of carapax of a male, two inches and five lines; greatest breadth, three inches nine and one-fourth lines; ratio of length to breadth, 1 : 1·56.

ATERGATIS FLORIDUS (*Rumphius*), *De Haan*.

Plate 7, fig. 4, male, natural size.

From the Paumotu Archipelago, Society and Friendly Islands, and Feejees, in the Pacific.

Carapax smooth and shining, faint areolation anteriorly, colour deep green, passing into and covered with a network of white or yellowish white. Crests of joints of legs bluish purple. Hand and carpus same colour as carapax externally, fading below to white; following legs clouded and dotted with umber, excepting the purple crests. Length, one to one and a half inches: one male specimen fourteen and a half lines long, twenty-two lines broad; ratio of length to breadth, 1 : 1.51. The antero-lateral margin is thin, and is faintly divided by very minute emarginations into three lobes. Crest of hand entire, outer surface nearly smooth or faintly reticulated. Eight posterior legs naked, excepting a small tuft on fifth joint near middle of lower margin, and tarsus pubescent.

*Cancer floridus*, RUMPHIUS, Amb., pl. 8, f. 5.

*Atergatis floridus*, DE HAAN, Faun. Japon., 46.

*Cancer ocyroe?* HERBST, iii., pl. 54, f. 2.

GENUS CARPILIUS, *Leach*.

The smooth and nearly terete legs, the four-lobed front, the smooth carapax, and antero-lateral longer than postero-lateral margin, with something of an angle between, give the Carpilii a peculiar look. The group would hardly admit of division, even if the furcate character of the inner branch of the first pair of maxillipeds should fade out in some species. We should rather conclude that this character is not as important as supposed.

## CARPILIUS CONVEXUS.

Plate 7, fig. 5*a*, animal, natural size; *b*, abdomen.



From the Feejee Reefs; also from the Sandwich Islands.

Length of carapax, about one and three-fourths inches; greatest breadth, two and one-fourth inches.

In a vertical view the front appears nearly straight, and the margin is not deeply lobed. The antero-lateral margin is obtusely rounded, and terminates in a low obtuse tooth.

Colour, deep flesh-red, with irregular blotches on the carapax of deep carmine and brownish red. Legs of a uniform flesh-red tint; tarsus with brown tips.

*Cancer convexus*, FORSKAL, 88, No. 34.

*Carpilius convexus*, RUPPELL, Krabben des rothen Meeres, 13, pl. 3, f. 2. M. EDWARDS, Crust., i. 382, pl. 16, figs. 9, 10.

#### CARPILIUS MACULATUS (*Linn.*)

Raraka, Paumotu Archipelago, and the Navigator and various other islands in the Pacific; also Manilla, Philippine Islands.

Length of carapax of one specimen, four and one-eighth inches; greatest breadth, five and three-eighths inches; ratio of length to breadth, 1 : 1.3. The bright-red spots on the carapax are eleven in number, and look like red wafers: there are two on each antero-lateral region; three across the middle; and four smaller across the posterior part of the carapax. The surface is somewhat shining and smooth, though a little wrinkled along the rounded antero-lateral margin. The front is very projecting, showing the lobes quite prominent in an upper view, the two middle projecting a little beyond the outer, and all much beyond the line of the orbits.

*Cancer maculatus*, LINN., Mus. Lud. Ul., p. 433; HERBST, pl. 6, f. 41, and pl. 21, f. 118, and pl. 60, f. 2.

*Carpilius maculatus*, EDWARDS, Crust., i. 382; Illust. Cuv., pl. 11, f. 2.

#### GENUS LIOMERA, *Dana*.

*Carpilio aspectu, pedibus nudis margines obtusis, antennisque similis. Carapax valde transversus, subellipticus, lateribus rotundatis, margine antero-laterali non brevior quam postero-lateralis, fronte brevissimè*

*bilobato. Ramus maxillipedis 1mi internus non lobatus, apice fere rectus. Pedes usque ad tarsos nudi.*

Resembles *Carpilius* in general appearance, in naked feet with obtuse margins, and in the antennæ. Carapax very transverse, elliptical, the sides being rounded; front very short, two-lobed. Inner branch of first maxillipeds not lobed, the anterior margin nearly straight. Feet even to the tarsi, naked.

*Liomera* has not the four-lobed front, nor the furcate inner branch of the first maxillipeds which characterize *Carpilius*. The carapax is very transverse and elliptical, with the inner branch entire. The *Carpilius cinctimanus* of White (Samarang, pl. 7, f. 4), is evidently of this genus.

The genus *Liagora* has the characters of *Liomera*, but yet a different aspect, as the carapax, although with rounded sides, is not very broad, and the antero-lateral margin is shorter than the postero-lateral. The tarsi, moreover, are hirsute in lines.

#### LIOMERA LATA.

*Carapax nitidus, valde transversus, transversim bene ellipticus, anticè versus marginem anticum subareolatus, in medio areolis inconspicuis; fronte brevi, perpendiculariter deflexo, superne viso fere recto et super orbitas vix saliente, leviter emarginato; margine antero-laterali crasso et crassè rotundato, 4-lobato, lobis secundo tertio quarto validis, rotundatis, tertio majore. Pedes antici æqui, mediocres, manu lævi, digitis brevibus.*

Carapax shining, oblong transverse and neatly elliptical, anteriorly towards front margin subareolate, but about middle, areolets indistinct; front short, vertically deflexed, nearly straight as seen from above, and hardly more salient than the orbits, emarginate; antero-lateral margin thick and rounded, four-lobed, lobes rounded, second, third, fourth stout, the third largest. Anterior feet equal, of moderate size; hand smooth, fingers short.

Plate 7, fig. 6 *a*, female, natural size; *b*, under view, of front showing outer antennæ; *c*, outer maxilliped; *d*, abdomen of female.



Feejee Islands.

Length of carapax, seven lines; greatest breadth, thirteen and one-half lines; ratio of length to breadth, 1 : 1·93, or nearly 1 to 2. The colour is red, excepting a white band to the tarsus just anterior to the claw, which is brownish black. The surface is polished and smooth. The areolet 1 M is convex, and so the front margin of 2 M to the right of 1 M; but 1 M fades into 2 M, and the latter is hardly distinct behind. A large areolet corresponding to 2 L, 3 L, is the only distinct one in the antero-lateral region, although a depression extends inward from the limits of the penult tooth. The upper and lower margins of the hand are parallel, and the fingers are short. There is no trace of a tubercle at the external angle of the orbit; the first lobe of the antero-lateral margin has a straight margin, and is but slightly divided from the second lobe.

GENUS ACTÆA, *De Haan*.

*Regio carapacis postica plana, antero-lateralis frontalisque declives. Orbita hiatu externo non interrupta. Articulus antennarum externarum Imus frontem attingens.*

Posterior part of carapax flat, the frontal and antero-lateral regions rounded and much inclined. Orbit not interrupted by a hiatus at the external angle. First joint of outer antennæ reaching the front and affixed to it.

This genus is closely allied to Actæodes, the difference consisting in the character of the fingers; and in some instances it is difficult to determine whether the fingers are pointed and not excavate, owing to the transitions between the two genera. It differs from Zozymus in the pointed fingers, and also in not having the eight posterior legs cristate.

ACTÆA AREOLATA.

X. *hirtissimo vel specioso affinis. Carapax latior, valde transversus, infra omnino brevissimè hirsutus, supra omnino areolatus, subtilissimè hirsutus, capillis vix longioribus quam granuli, areolâ 2 M subdivisâ,*

*ejus portione externâ etiam partim subdivisâ, 3 M tripartitâ, 1 P tripartitâ; margine antero-laterali longo, leviter 5-lobato, postero-laterali brevi, valde concavi. Pedes brevissimè hirsuti; antici subæqui, granulosi, manu carpoque paulo nodosis, digitis striatis, scabris, brevissimè hirsutis, bene triangulato-dentatis. Pedes postici granulosi dense brevissimèque hirsuti.*

Near *X. hirtissimus* or *speciosus*. Carapax broader transverse, below very short hirsute, above areolate throughout and very minutely hirsute, the hairs hardly longer than the granules, areola 2 M subdivided, and its outer part also in part subdivided; 3 M tripartite; cardiac tripartite; antero-lateral margin long, faintly five-lobed, postero-lateral short, very concave. Feet very short hirsute; anterior pair subequal, granulous, hand and carpus somewhat nodose, fingers striate, very short hirsute, regularly triangulato-dentate. Posterior feet granulous, densely and very short hirsute.

Plate 8, fig. 1 *a*, outline of carapax, enlarged two diameters; *b*, surface more enlarged, showing tubercles and hairs.

Sooloo Sea, or Balabac Straits.

Length of carapax of a female, 5·9 lines; greatest breadth, 9·33 lines; ratio of length to breadth, 1 : 1·58. This is a much broader species in proportion to its length than either the *hirtissimus* or the *speciosus*, and is smoother than the former, though not as smooth as the latter. The granulations of the eight posterior legs are scarcely apparent unless the dense hirsute covering is removed, yet this hirsute covering is extremely short. The furrows appear to be hirsute, unless examined with care, when the hairs of the furrow are found to proceed mostly from the edges of the areolets. The lobes of the antero-lateral margin are rather indistinct. The fingers have six or seven teeth, which, excepting the terminal, are thin and triangular, and just equal the intervening spaces, into which the teeth of the opposite finger fit. The pterygostomial region has furrows as in the *hirtissimus*.

The *rufopunctatus*, according to Edwards, has five *large* rounded teeth to the antero-lateral margin, and the postero-lateral margin is nearly straight; moreover, the pterygostomial region is without furrows.



## ACTÆA CELLULOSA.

*Carapax anticè posticèque malè areolatus, omnino cellulosus, nudus, margine antero-laterali imperfectè 3-4-lobato et cellulis excavato, margine postero-laterali perbrevis, concavo. Pedes antici subœqui, manu carpoque superficie cellulosis, manu extus infraque subtiliter villosâ, digitis scabris, etiam villosis. Pedes 8 postici cellulis excavati, breves.*

Carapax throughout imperfectly areolate, and surface cellulous, naked, antero-lateral margin imperfectly three to four lobed and excavated with cellules, postero-lateral margin very short, concave. Anterior feet subequal, hand and carpus with a cellulous surface, hand inside and out fine villous, fingers scabrous and also villous. Eight posterior feet short, surface excavated with cells.

Plate 8, fig. 2, female (having eggs under the abdomen), enlarged four diameters.

From Tutuila, Samoan Group.

Length of carapax of female, 3 lines; greatest breadth, 4.3 lines; ratio of length to breadth, 1 : 1.43. The animal looks like a worn pebble of cellular coral. The whole surface of the carapax is cellular; and the legs, when drawn up, may be mostly concealed beneath the carapax. Traces of the areolets may be made out over the back, but they are not well defined. The surface between the low prominences of the antero-lateral margin has in each case a deep hollow excavated in it. The postero-lateral margin is quite concave, and the surface against which the posterior legs rub is flat, making an angle with the surface of the carapax above. The under surface of the body is very short villous throughout, the outer maxillipeds included.

ACTÆA HIRSUTISSIMA (*Rüppell*), *De Haan*.

Upolu, Samoan Group.

The specimens from Upolu are closely like Rüppell's figure (Op. cit., 26, pl. 5, f. 6).\* The whole surface is rough with short bristles, rather shorter than in Rüppell's figure (projecting above the granules about as much as the diameter of the granules), and the legs have the same hirsute character. The under surface of the body is very short hirsute throughout. The fingers of the hand are striate and scabrous, and also minute hirsute, like the hand. Length of carapax of a female, 6.15 lines; greatest breadth, 9 lines; ratio of length to breadth, 1:1.46. There is no long ciliation to the upper margin of the posterior legs, this margin being short and rough hirsute, like the lateral surface of these legs. Fingers channeled, and inner margin denticulate. The intervals between the areolets are not pubescent. The antero-lateral margin is five-lobed, as observed after removing the hairs, and not before (Plate 8, fig. 3). These lobes are the normal ones, D, E, N, T, S. They are broad and truncate (excepting S), with the margin irregularly denticulate. Between D and E, but on a lower level, there is another small prominence, *d'*. This description does not agree entirely with that by Milne Edwards (Crust., i. 389); but the specimens answer so well to Rüppell's figure and description, that we forbear naming it anew. It has many of the characters of the *rufopunctatus* of Edwards; but the postero-lateral margin is very concave, and its proportions are those of Rüppell's figure, instead of being "beaucoup moins ovoïde;" and the pterygostomial region is sulcate, very distinctly so, the sulci corresponding to the intervals between the marginal lobes.

Another smaller specimen from the Sooloo Sea has similar characters. The length of the carapax is but 2.6 lines; and the ratio of length to breadth, is 1:1.43. The under side of the body appears smoother, and the outer maxillipeds nearly naked; but this may be owing to its younger state. The general colour of the carapax is light, yet the short hairs are dark. The specimen resembles much the figure referred to *Ægle rugata* by Adams and White (Crust. Samarang, pl. 8, f. 5), but the fingers are pointed.

#### GENUS XANTHUS.

The groups Xantho, Paraxanthus, Euxanthus, and Xanthodes, are

\* Not pl. 4, fig. 8, as in Milne Edwards's Crust., i. 389.



properly subgenera of the genus *Xanthus*. Through *Xanthodes* there is a passage to the narrow form in *Pilumnus*; yet the species, as in other *Xanthi*, have the male abdomen always five-jointed. Though *Paraxanthus* has the first basal joint of the outer antennæ quite short, the front does not send down a narrow process to meet it; and in this particular, as also the expanded and rounded sides of the carapax, and produced front, it differs from *Xanthodes*.

SUBGENUS XANTHO.

1. *Pedes 8 postici cristati*.

XANTHO NITIDUS.

*Carapax lævis, paulo nitidus, anticè partim leviter areolatus, areolis 2 M, 5 L, 6 L, posticè vix circumscriptis; fronte fere recto, non emarginato, margine antero-laterali leviter 3-4-lobato, lobis subtriangulatis, angulo orbitali externo non saliente. Pedes antici subæqui, inermes, fere læves (subtilissimè corrugatæ), manu bene cristatâ, digito mobili subcristato et dente basali magno carente. Pedes 8 postici bene cristati, fere nudi, marginibus integris, apice margineque inferiore articuli 5ti brevissimè hirsuto-villosis, tarso supra infraque etiam villosi.*

Carapax smooth, a little shining, anteriorly in part faint areolate, areolets 2 M, 5 L, 6 L, hardly circumscribed behind; front nearly straight, not emarginate, antero-lateral margin faint 3-4-lobed, lobes subtriangulate, outer orbital angle not salient. Anterior feet subequal, unarmed, nearly smooth (very minutely corrugate); hand neatly cristate, moveable finger subcristate, not having a large inner tooth. Eight posterior feet neat cristate, nearly naked, margins entire, apex and under margin of fifth joint very short hirsute, villous, tarsus above and below villous.

Plate 8, fig. 4 *a*, male, enlarged three diameters; *b*, abdomen of male.

Feejees or Tongatabu.

Length of carapax of male, 3.2 lines; greatest breadth, 5 lines; ratio of length to breadth, 1:1.56. The areolets 2 F are distinct, also the anterior or outer limits of 1 M, 2 L, 4 L; 2 L and 3 L are not

separated, and the posterior limits of the areolets are indistinct. The legs are smooth and shining, not at all granulous. Under the microscope, the hand and carpus appear a little corrugate. The apex of the fifth joint of the eight posterior legs has a triangular surface, which is very short hirsute. The first of the four lobes of the antero-lateral margin has a nearly straight outline, and is but faintly separated from the following, the others are very low triangular.

## XANTHO SUPERBUS.

*Carapax paulo convexus, anticè sed non medio areolatus, areolis 3 M, 4 M, 5 L, 6 L fere coalitis et posticè vix circumscriptis, sulcis anterioribus villosis; fronte paulo sinuoso, emarginato; margine antero-laterali crassè 4-dentato, dentibus duobus anticis subrotundatis. Pedes cristati, manu extus subseriatim minutè tuberculatâ, supra valde cristatâ; pedibus posticis margines densè hirsutis, tarso villosa.*

Carapax but little convex, anteriorly areolate but not at middle, areolets 3 M, 4 M, 5 L, 6 L, almost coalescent and posteriorly hardly circumscribed, anterior sulci villous, front a little sinuous, emarginate; antero-lateral margin coarsely four-toothed, two anterior teeth subrotund. Feet cristate; hand externally subseriately small tuberculate, above strongly cristate; posterior feet with the margins densely hirsute, tarsus villous.

Plate 8, fig. 5 *a*, female, natural size; *b*, abdomen.

From Raraka Island, Paumotu Archipelago.

Length, thirteen lines; greatest breadth, twenty-one lines; ratio of length to breadth, 1 : 1.6. Colour of carapax, large vermillion blotches neatly shaded on a whitish ground; anterior margin and parts of the antero-lateral bluish purple; upper margin of joints of legs in part bluish purple, and the rest of the legs clouded with vermillion and flesh-red; fingers brownish black. The areolets 1 M and 2 M are united, and the anterior margin is abrupt, the furrow or surface just anterior being villous; but posteriorly the areolet 2 M is lost, and the same is true of 5 L, 6 L, which are in one. 4 L is distinct and prominent; and 2 L, 3 L, are united. The outer surface of the hand is imperfectly beaded in lines. The hairs of the legs are yellow.



2. *Pedes 8 postici non cristati.*

## XANTHO DISPAR.

*Carapax fere planus, ellipticus, latere rotundatus, non nitidus, anticè non bene areolatus, prope marginem impressus, margine antico areolarum 1 M, 2 M paulo impresso, lineis duabus regionem antero-lateralem intersecantibus; fronte fere recto, non producto, margine antero-laterali crassiusculo, subacuto, fere integro, levissimè trilobato, lobo antico (D, E, N respondente) plus duplo longiore quam secundus (T), angulo post-orbitali non saliente. Pedes antichi valde inæqui, manu supra latè rotundatâ, corrugatâ et partim granulosa, digito mobili non canaliculato, dente magno basali. Pedes 8 postici breves, subnudi, articulis 4to 5to supra granulosi, 5to tarsoque minutè villosis.*

Carapax nearly flat, elliptic in outline, surface not shining, sides rounded, anteriorly not distinctly areolate, but with impressions near the margin, anterior margin of areolets 1 M, 2 M a little impressed, two elevated lines cross the antero-lateral region; front nearly straight, not produced; antero-lateral margin rather stout, subacute, nearly entire, very faintly trilobate, anterior lobe (corresponding to D, E, N), more than twice as long as the second, post-orbital angle not salient. Anterior feet very unequal, hand broad rounded above, corrugate and somewhat granulous, moveable finger not channeled, having a large basal tooth. Eight posterior feet short, nearly naked, fourth and fifth joints granulous above, fifth and tarsus minutely villous.

Plate 8, fig. 6 *a*, female, enlarged two diameters; *b*, front view of part of front; *c*, side view of large hand; *d*, abdomen of female.

Rio Janeiro?

Length of carapax of female, five and a half lines; breadth, eight and one-fourth lines; ratio of length to breadth, 1 : 1.5. This species is near the *planus*; but the front is not projecting and is far more inclined; the outline is more elliptical; the fourth joint of the eight

posterior legs is not naked on its lateral surface; the carpus and hand have an uneven surface; the margin just posterior to the orbits is very thick; and the antero-lateral region is crossed by two lines slightly raised. These lines last alluded to, run from the emarginations separating the lobes of the margin, and pass inward and a little forward with a curve; the anterior is the front margin of areolets 2 L, 3 L united, and the posterior, the same of 5 L. Part of the outline of 2 M is distinct. The fingers of the small hand are quite long and slender. The third joint of the outer maxillipeds is shorter than wide. The front as seen in a vertical view is but very slightly sinuous.

In the *X. Gaudichaudii*, according to Milne Edwards, the distance between the orbits is very small; and in his figure (D'Orbigny's S. A. Crust., pl. 5, fig. 4), the distance is about two-ninths of the whole breadth; while in the species here described it is nearly one-third. From the *X. punctatus* it differs in the hands not being smooth.

## XANTHO MINOR.

*X. parvulo affinis.* Carapax anticè areolatus, areolis leviter elevatis 2 M, 3 M, 5 L, 6 L posticè circumscriptis, 2 M cum rugâ transversim divisâ; fronte fere recto, leviter emarginato; margine antero-laterali tenui, 4-dentato, dentibus tribus posticis subtriangulatis. Pedes antici mediocres, carpo manûque supra paulo granulosis, manu extus leviter granulato-costatâ et supra sulcatâ, digito mobili cum dente magno basali non armato. Pedes 8 postici sparsim pubescentes.

Near *X. parvulus*. Carapax anteriorly areolate, areolets slightly raised, 2 M, 3 M, 5 L, 6 L circumscribed behind; antero-lateral margin thin, four-toothed, three posterior teeth subtriangular. Anterior feet of moderate size, subequal, carpus and hand above slightly granulous, hand exteriorly faint granulato-costate, and above sulcate, moveable finger not armed with a large basal tooth. Eight posterior feet sparsely pubescent.

Plate 8, fig. 7, female (with eggs), enlarged four diameters.

Probably from Madeira; possibly the Cape Verdes.



Length of carapax, 2.1 lines; greatest breadth, 3.1 lines; ratio of length to breadth, 1 : 1.48. This species has the transverse linings of the *parvulus*, arising from the very thin trenchant or harsh edge bounding or crossing transversely some of the areolets. But the form is narrower, and more convex; the antero-lateral teeth are somewhat peculiar, and the hands are also different, besides wanting the large basal tooth of the moveable finger. The female, although so small, is well furnished with eggs, proving that it has nearly or quite its adult size. The fifth joint of the eight posterior legs is not properly hirsute on both margins, as in the *parvulus*.

XANTHO PARVULUS (*Fabr.*), *Edwards*.

Cape Verdes.

The following are the characters of the specimens referred to this species. Length of the carapax of a male, five lines; greatest breadth, seven and two-thirds lines; ratio of length to breadth, 1 : 1.53. Front nearly straight, emarginate. Carapax not shining, anteriorly areolate, but areolets slightly prominent, and 2 M, 3 M, 5 L, 6 L, hardly distinct posteriorly, or altogether indistinct. Surface of areolets with some interrupted transverse lines, like the anterior edges of the areolets. Antero-lateral margin thin, four-toothed or lobed, corresponding to D, E, N, T, S; the first lobe most elevated in its posterior half and rounded, and its inner angle (at the orbit) not salient; second lobe truncate; third, subtriangular, but the posterior side much the longer; fourth, more dentiform and narrower; all the lobes having the surface somewhat granulous or uneven in surface, as seen under a lens. Hand rounded above, surface faintly corrugate or uneven under the microscope, and the same is true of the carpus; outer surface not at all costate. Moveable finger not channeled, and having in both sexes a large oblique basal tooth. Posterior eight legs rather slender, fourth joint somewhat hirsute above, fifth hirsute above and below, tarsus hirsute.

*Cancer parvulus*, FABR., Ent. Syst., ii. 451.

*Xantho parvulus*, EDW., Crust., i. 395.

XANTHO FLORIDUS, *Leach.*

Madeira.

The areolets are distinct over the anterior part of the carapax. 1 L, however, is wanting or nearly so, 2 L, 3 L, are coalesced, and 1 M, 2 M, are hardly separated. 2 M is simple. The teeth are the normal ones, E, N, T, S; the outer angle of orbit (D) is not raised into a tooth. A good figure of this species is given in Bell's British Crustacea, p. 51, and another in Edwards's *Illust. Cuv. Crust.*, Pl. 11 bis, f. 3.

XANTHO PLANUS (*Edw.*)

Valparaiso.

Colour of specimens a dull brownish purple, at times spotted with white or yellowish white posteriorly. None of the regions of the carapax are distinct, yet a faint outline of the medial may be perceived. The lateral tooth of the carapax is S, and another less distinct is T; a faint fissure anteriorly separates the regions of E and N, but there is no mark between D and E; and D itself is not at all projecting.

Length of carapax of a male, two inches and eleven lines; greatest breadth, four inches and three lines; ratio of length to breadth, 1:1.46. In another male, length, one and thirteen-sixteenths inches; greatest breadth, two and thirteen-sixteenths inches; ratio, 1:1.55. In a female, length, two and five-sixteenths inches; greatest breadth, three and a half inches; ratio, 1:1.51.

*X. planus*, M. EDWARDS, *Hist. Nat. des Crust.*, i. 397, and *Crust.*, D'Orbigny's *S. America*, 14, pl. 6, fig. 1.

## XANTHO ORBIGNYI.

Callao, Peru.

Length of carapax of a female, one and seven-sixteenths inches; greatest breadth, two and one-sixteenth inches; ratio of length to breadth, 1:1.43. The areolation is rather faint, yet the medial



region may be distinguished. In the figure in D'Orbigny's Crustacea of S. America, the margin appears to be reflexed, which is not the fact with the species. The front is two-lobed, with each lobe emarginate or bidentate. The antero-lateral margin consists of ten teeth, the two preceding the last being partly double (or *nine*, considering the last three as double). The last is the fifth normal (or S). The species is remarkable for the unusual length of the third joint of the outer maxillipeds, the apex being prolonged forward and narrowing. In our specimen—a dried, weathered one—the first joint of the outer antennæ does not reach the front, and is like that of *Pseudocarcinus*.

*X. Orbignyi*, M. EDWARDS and H. LUCAS, D'Orbigny's Crust. S. A., 14, pl. 7, fig. 1.

SUBGENUS PARAXANTHUS, *Lucas*.

If the group *Paraxanthus* is retained as distinct, the following species should be referred to it. It has the horizontally-produced front, the rounded and expanded sides, the narrow abdomen, and the short antennary joint of the typical species of *Paraxanthus*.

PARAXANTHUS SEXDECIMENTATUS (*Edw. and Lucas*), *Dana*.

Callao, Peru, or Valparaiso.

Length of carapax of a male, one inch five lines; greatest breadth, two inches; ratio of length to breadth, 1 : 1.41. The areoletts are about as distinct as represented in the figure of *Etisus levimanus* (Pl. 10, fig. 1), and are wholly misrepresented in the figure in D'Orbigny's work. The nine teeth of either margin of the carapax (*eight* exclusive of the orbital), correspond normally as follows: the eighth to S; the seventh and sixth to T; the fifth and fourth to N; the third and second to E; and the first or orbital is D. This arrangement is apparent, as in other cases, from their position with reference to the areoletts 2 L, 3 L, 4 L, adjoining. The ninth tooth is a posterior one (*s*), and the species thus approximates in form to some *Cancers*.

*Xantho sexdecimentatus*, M. EDWARDS and H. LUCAS, in Crust., D'Orbigny's S. A., 15, pl. 7, f. 2.

## SUBGENUS EUXANTHUS.

*Xantho affinis.* *Articulus antennarum externarum primus orbitæ fissuram ad summum implens, cavitate in ejus apicis latere antico articulum proximum gerente. Margo antero-lateralis sub orbita anticè productus.*

Near *Xantho*. The first joint of the outer antennæ quite filling the orbital fissure, and a cavity in the anterior side of the apex bearing the next joint. Antero-lateral margin continued forward beneath the orbit.

The orbital fissure occupied by the basal joint of the outer antennæ is quite filled with this joint, and the summit of the joint, instead of giving insertion to the next joint from near its middle, has a cavity in the anterior margin, from which the second joint of the antennæ proceeds, and in the two species observed, this second joint scarcely projects above the outline of the cavity. In one species this cavity is elongated towards the orbit, and is scarcely separated from it, while in the other it is nearly circular, and is wholly separated from the orbit. The hands are equal, and rather small.

## EUXANTHUS SCULPTILIS.

*Carapax anticè posticèque profundè areolatus, areolâ 2 M bipartitâ ejus partibus transversim subdivisis, totisque areolis plus minusve rugatis aut incis; fronte inter-antennali bilobato, paulo prominente, margine orbitæ sub antenna saliente; margine antero-laterali 6-7-dentato, dentibus sat crassis, pyramidicis, obtusis. Pedes antici æqui, carpo crassè nodoso, manu supra tuberculatâ, extus costatâ, digito mobili supra denticulato. Pedes postici mediocres, articulo tertio granuloso, 4to 5to supra rugatis aut tuberculosi, tarso villosi. Abdomen valde areolatum.*

Carapax anteriorly and posteriorly profound areolate, areolet 2 M



bipartite, its halves transversely subdivided, and all the areolets more or less rugate or incised; inter-antennary front 2-lobed, little prominent, margin of orbit below the antennæ salient; anterolateral margin 6-7-toothed, teeth rather stout, subpyramidal, obtuse. Anterior feet equal, carpus coarse nodose, hand tuberculate above, costate without, moveable finger denticulate above. Posterior feet of moderate size, third joint granulous, fourth and fifth joints rugate above or tuberculous, tarsus villous. Abdomen strongly areolate.

Plate 8, fig. 8 *a*, animal, natural size; *b*, front view of base of outer antennæ and eye; *c*, view of orbit seen perpendicularly, and showing summit of base of antennæ; *d*, hand, natural size.

Feejees, or Tongatabu.

Length of carapax of a female, eleven and a half lines; greatest breadth, seventeen and a half lines; ratio of length to breadth, 1:1.52. The furrows of the surface are deep, and the whole carapax has a rough look. A male in the collections is a little smaller, measuring ten and a half lines in length; and fifteen and a half in breadth; ratio of length to breadth, 1:1.5. The abdomen is very much embossed, and the sternum also, in the male. The teeth are somewhat irregular. On one side of the male there are the five D, E, N, T, S, and another *d'*, just below the level of D, E. On the opposite side, there is an extra tooth just posterior to T. The line of the lateral margin extends forward to a point some distance below the orbit. On the outer surface of the carpus there are two large rounded tubercles. The costæ of the outer surface of the hand are irregularly granulate. The fingers are channeled.

#### EUXANTHUS NITIDUS.

*E. sculptili* quoad pedes anticos et posticos, marginem carapacis anterolateralem, et frontem similis. Carapax omnino valde areolatus, areolis plerumque levibus, interdum leviter rugatis, angulo orbitæ externo tenui et non tuberculiformi nec angulato.

Near *E. sculptilis* in the anterior and posterior feet, antero-lateral margin of the carapax and front. Carapax throughout strong areolate, areolets for the most part smooth, sometimes slight rugate, outer angle of orbit thin and not tuberculiform nor angulate.

Plate 8, fig. 9 *a*, animal, natural size; *b*, view of orbit from above, showing summit of outer antennæ.

Feejees, or Tongatabu.

Length of carapax, nine lines; greatest breadth, fourteen lines; ratio of length to breadth, 1 : 1.55. The two posterior teeth of the antero-lateral margin are distant, and a nearly straight margin intervenes between them. The areolets are smooth, with only faint wrinkles, where any, and the surface is a little shining.

#### SUBGENUS XANTHODES.

In this group, the first joint of the outer antennæ is rather short, though meeting the front, a frontal process being elongated towards it. The form of the carapax in our species approaches that of *Pilumnus* and *Eriphia*. The genus has the same relation to *Xantho*, as our *Pilodius* to *Chlorodius*. The carapax in the species described has the normal number of teeth, except that *E* is sometimes wanting, and *D* or the margin of the orbit is often not elevated into a tooth. At tooth *S*, the margin has an abrupt angle, as in most species of *Xantho*, and is not rounded as in the species of the genus *Paraxanthus*. The third joint of the outer maxillipeds is shorter than wide, and is shorter at the outer margin than at the inner, with the terminal margin nearly straight.

#### XANTHODES GRANOSO-MANUS.

*Carapax lævis, prope margines anticum et antero-lateralem granulatus, anticè parce areolatus, areolis 2 M 3 M posticè sæpius vix circumscriptis, 4 L 5 L 6 L coalitis et posticè non circumscriptis; fronte fere*



*recto, emarginato, margine antero-laterali non tenui, 5-dentato, dentibus sat isolatis, vix acutis, D vix prominente, E parvulo, granuliformi. Pedes antici fere æqui, manu supra rotundatâ supra infraque granulosa, extus latè costatâ, costis granulosis, carpo granuloso, digitis canaliculatis. Pedes postici fere nudi, articulis quarto quintoque supra granulosis, tarso brevissimè villosa.*

Carapax smooth, granulous near anterior and antero-lateral margins, anteriorly slightly areolate, areolets 2 M, 3 M behind usually hardly circumscribed, 4 L, 5 L, 6 L coalescent and posteriorly not circumscribed; front nearly straight, emarginate, antero-lateral margin not thin, 5-dentate, teeth rather separate, hardly acute, D scarcely prominent, E small, granuliform. Anterior feet nearly equal, hand rounded above, above and below granulous, outer surface with a few wide granulous costæ, carpus granulous, fingers channeled. Posterior feet nearly naked, fourth and fifth joints granulous above, tarsus very short villous.

Plate 8, fig. 10 *a*, female, enlarged two diameters; *b*, front view of front, showing its antennary process and the outer antennæ; *c*, hand, outer view.

Tutuila and Upolu, Samoan Islands; also probably from the Society, or Paumotu Islands.

Length of carapax of a female, four and one-fourth lines; breadth, six and one-fourth lines; ratio of length to breadth, 1 : 1.47; in another specimen, a male, length, two and three-fourths lines; breadth, four and one-tenth lines; ratio, 1 : 1.49. Colour (believed to be of this species), irregularly blotched and spotted with brown on a grayish or yellowish white base. Anterior legs yellowish white, fingers brownish black. The hand is granulous below as well as above, and the costæ of the outer surface, instead of being single rows of granules, are low longitudinal ridges closely covered with granules. The teeth of the antero-lateral margin are not properly acute. The absent one of the normal teeth is E. The outer angle of the orbit is not at all elevated, the thin rim of the orbit being evenly continuous around the other side. The carpus has an indentation on the outer surface, a short distance from the anterior margin. The orbit is very nearly circular with an entire (or nearly entire) and even margin.

The palate is not divided longitudinally either side of the middle by a ridge, and the species is thus remote from the Eriphidæ.

## XANTHODES NITIDULUS.

*Carapax lævis, nitidus, anticè partim areolatus, areolis 1 M 2 M 3 M vix discretis, 2 L 3 L extus abruptis, 2 L cum 4 L 5 L 6 L sæpius coalitis, hisque posticè non bene circumscriptis, 3 L circumscriptâ; fronte leviter arcuato, emarginato; margine antero-laterali 4-dentato, dente D obsoleto, dentibus E, N, T, S, subconicis, subacutis, nitidis. Pedes antici paulo inæqui, inermes, læves, manu supra obtusâ, prope marginem supernum uni-caniculatâ; carpo prope articulationem apicalem paulo exarato. Pedes 8 postici margine superno articulorum 3tii, 4ti, 5ti valde hirsuti, tarso hirsuto, articulo tertio supra non denticulato.*

Carapax smooth, shining, anteriorly somewhat areolate, areolets 1 M, 2 M, 3 M hardly separated, 2 L, 3 L, on their outer limits abrupt, 2 L with 4 L, 5 L, 6 L usually coalescent, and not well circumscribed behind, 3 L circumscribed; front slightly arcuate, emarginate; antero-lateral margin four-toothed, tooth D being obsolete, teeth E, N, T, S, subconical, subacute, shining. Anterior feet a little unequal, unarmed, smooth, hand above obtuse, a single channel in upper margin, carpus near its articulation with the hand somewhat excavate. Eight posterior feet with the upper margins very hirsute, tarsus hirsute, third joint not denticulate above.

Plate 8, fig. 11 *a*, male, enlarged two diameters; *b*, front view of front, showing base of outer antennæ; *c*, outer view of hand.

From the Paumotu Archipelago.

Length of carapax of male, five lines; greatest breadth, seven and two-thirds lines; ratio of length to breadth, 1:1.53. The hairs of the legs are unequal or uneven, and the legs appear quite hirsute, although only so on the outer margin and part of inner surface, excepting the inner margin of the fifth joint. On the outer surface of



the carpus there is an impression, near the anterior margin, which is in shape nearly like a V reversed.

XANTHODES NOTATUS.

*Carapax anticè bene areolatus, areolis planis, fere lævibus vel subtilissimè erosis, sulcis abruptis, fronte fere recto, emarginato; margine àntero-laterali 5-dentato, dente D fere obsoleto, E, N tuberculiformi, T, S, acutis, spiniformibus. Pedes anticì valde inæqui, manu carpoque majoribus minutè tuberculatis, manu infra lævi, nitidâ, manu carpoque minoribus spinulis densè armatis. Pedes 8 postici hirsuti, articulo tertio supra denticulato.*

Carapax anteriorly neat areolate, the areolets flat with abrupt sulci between and surface nearly smooth or very minutely erose; front nearly straight, emarginate, antero-lateral margin five-toothed, tooth D, nearly obsolete, E, N, tuberculiform, T, S, acute spiniform. Anterior feet quite unequal, larger hand and carpus small tuberculate, hand smooth above, shining, smaller hand and carpus densely armed with spines. Eight posterior legs hirsute, third joint above denticulate.

Plate 8, fig. 12 *a*, female, enlarged three diameters; *b*, part of front, as seen in a front view, with part of base of outer antennæ.

Paumotu or Society Islands; also Sandwich Islands.

Length of carapax of female (with eggs), three and two-thirds lines; greatest breadth, five and a half lines; ratio of length to breadth, 1 : 1.5. The sulci are abrupt and the areolation neat and complete, excepting posteriorly. 3 M is very distinct; but 4 M is very narrow and indistinct. In a Sandwich Island specimen (a female), the left hand is very much the larger, and the reverse is true of the other specimen from south of the equator, which also is a female. The moveable finger of the large hand is not channeled. The posterior or outer surface of the fifth pair of legs is smooth and naked, while the margin is denticulate and towards apex hirsute. The following joints are hirsute throughout.

GENUS MENIPPE, *De Haan.*

In the genus *Menippe* of De Haan (*Pseudocarcinus* of Edwards), the antero-lateral margin is usually rather shorter than the postero-lateral, yet the difference is often but slight. The prælabial plate is undivided, as in other Xanthinæ; but there are related species, similar in the base of the outer antennæ, which belong with the Eriphidæ, and constitute the genus *Pseudozius*.

The genus *Pelæus* of Eydoux and Souleyet, figured in the Voyage of the Bonite, appears, from the figure and from specimens examined by us, to be identical with *Menippe*. The species *P. armatus* is from the Sandwich Islands.

## MENIPPE RUMPHII.

## Rio Janeiro?

Length of carapax of female, two and one-half inches; greatest breadth, three and three-fourths inches; ratio of length to breadth, 1:1.5. The general characters are well given by M. Edwards (Crust., i. 408). The teeth of the antero-lateral margin are simply the normal teeth, D, E, N, T, S. The breadth of the carapax from T to T is hardly less than from S to S. The areolation is anteriorly quite distinct. 2 F is a rounded prominence either side of the medial line. 1 M is still more prominent and coalesces with 2 M. The areolet of the antero-lateral region are about as distinct as in our figure of *Etisus levimanus* (Plate 10, fig. 1). The tarsi have a dense hirsute coating, excepting along a narrow line on either side; and the upper margin of the preceding joint is in part similarly hairy.

The outer maxillipeds have the third joint widest on the inner side, the anterior margin inclined and somewhat concave.

*Cancer Rumphii*, FABR., Supp., 336.

*Menippe Rumphii*, DE HAAN, Faun. Japon. (1833), 21.

*Pseudocarcinus Rumphii*, EDWARDS, Crust., i. (1834), 408.

GENUS PANOPÆUS, *Edwards.*

In the characteristic species of this genus, the antero-lateral mar-



gin is thin and terminates in the outer orbital angle; and moreover it is shorter than the postero-lateral margin. The aspect of the species is neat.

PANOPÆUS LÆVIS.

*Carapax lævis, vix nitidus, non bene areolatus, fronte fere recto, non producto, minutè emarginato, margine antero-laterali tenui, 4-lobato, lobis 2do 3tio bene dentiformibus et acutis, margine eorum postico arcuato, 4to angustiore. Pedes antici valde inæqui, inermes, supra rotundati, manu lævi, extus paulo nitidâ, digito mobili lævi, dente magno basali carente. Pedes 8 postici tenues, marginibus pubescentibus, articulo tertio fere nudo.*

Carapax smooth, scarcely shining, not distinctly areolate, front nearly straight, not produced, minutely emarginate, antero-lateral margin thin, four-lobed, second and third lobes neatly dentiform and acute, the posterior margin of these teeth arcuate, fourth narrower. Anterior feet very unequal, unarmed, rounded above, hand smooth, a little shining on outside, moveable finger smooth, without a large basal tooth. Eight posterior feet slender, margins pubescent, third joint nearly naked.

Plate 8, fig. 13 *a*, male, enlarged two diameters; *b*, front view of front; *c*, right hand, front view.

Locality doubtful.

Length of carapax of male, five and a half lines; greatest breadth, seven and a half lines; ratio of length to breadth, 1:1.36. The anterior lobe of the antero-lateral margin has a thin margin and is arcuate posteriorly; the outer angle of the orbit is scarcely salient. The large hand is quite large, and there is a shallow sulcus near the upper side. Faint traces of areolets 2 M may be made out. The third joint of the outer maxillipeds is shorter than long, and has the anterior margin concave.

PANOPÆUS CRENATUS (*Edwards and Lucas*).

Callao, Peru.

Length of carapax of a male, ten and a half lines; greatest breadth, fifteen lines. The regions are very indistinct, yet the outline of the medial may be made out; it is somewhat narrower than a line connecting the outer orbital angles. 1 M is slightly apparent and so also 2 F. Very faintly also, 5 L and 6 L may be distinguished through a slight bending of the surface. The four teeth into which the thin margin is divided by slight incisions, represent all the normal teeth excepting the second (E), which is coalesced with the first or orbital. The tooth S is subacute, and the outline of the carapax declines backward in an oblique and nearly straight line directly from the summit of the tooth.

One female, with eggs under the abdomen, was only six lines in length.

*P. crenatus*, M. EDWARDS and H. LUCAS, Crust., D'Orbigny's S. A., 16, pl. 8, f. 1.

GENUS MEDÆUS, *Dana*.

*Carapax angustus, paulo transversus. Orbitæ margo inferior externusque dentibus tribus instructus. Frons sat brevis. Margo carapacis antero-lateralis sub orbita productus. Articulus antennæ externæ Imus uti in Xantho. Abdomen maris 5-articulatum, segmento ultimo brevi. Pedes antici crassi.*

Carapax narrow, somewhat transverse. Outer and lower margin of orbit formed of three teeth. Front rather short. Antero-lateral margin of carapax extending far below the line of the orbit. First joint of outer antennæ as in Xantho. Abdomen of male five-jointed, last segment short. Anterior feet stout.

This genus is very near Xantho,—the characters of the orbit, its very narrow form, and the fact that the lateral margin instead of extending towards the orbit takes a course much below it, being the



only peculiarities of importance. It has the form nearly of some *Pilumnus*, yet has no ridge to the prælabial plate, excepting an obsolete one over its posterior half. It is near *Halimede* of De Haan, but the male abdomen is only five-jointed and the last joint has not the unusual length seen in De Haan's species. The front, moreover, is not so narrow. The species is very deeply areolate and not villous.

#### MEDÆUS ORNATUS.

*Carapax paulo transversus, profunde areolatus, areolis asperatis præcipue in parte anteriore, nec 2 M nec 3 M subdivisâ, margine antero-laterali 5-6-dentato, dentibus D, d, E, N, T, S designatis, scabris, orbitâ 4 dentibus circumdatâ; fronte producto, latiore, bene emarginato, lobis margine concavis. Pedes antici asperè tuberculato, manu tuberculis asperatis fere oblongis nec acuminatis armatâ, digitis asperatis. Pedes postici pubescentes, articulo 3tio supra spinuloso.*

Carapax slightly transverse, deeply areolate, areolets asperate especially on anterior part of each, neither 2 M nor 3 M subdivided, antero-lateral margin five or six-toothed, the teeth being D, d, E, N, T, S, scabrous; orbit with four teeth on its margin, front rather broad, produced, deeply emarginate, lobes with a concave front margin. Anterior feet with rough or asperate tubercles, those of the hand a little oblong, not pointed, fingers asperate. Posterior feet pubescent, third joint spinulous along the upper margin.

Plate 9, fig. 1 *a*, male, enlarged two diameters; *b*, side view, showing relation of orbit and antero-lateral margin; *c*, front view of base of outer antennæ; *d*, outer maxillipeds; *e*, flagellum of outer antennæ, much enlarged; *f*, extremity of tarsus; *g*, one of the pectinated setæ of the tarsus, showing its setules.

Dredged at Lahaina, Island of Maui, Hawaiian Group.

Length of carapax, 5.1 lines; greatest breadth, 7 lines; ratio of length to breadth, 1 : 1.37.

The prominent areolets with an asperate surface, and the prominent tubercles of the oblong hand, give the species a peculiarly rough

though neat aspect. The species is broader than the *Halimede fragifer* of De Haan; the ratio of the length of the carapax to the breadth, in which, according to De Haan's figure, is 1:1.16. The antero-lateral teeth are somewhat reflexed, and T is the largest, and they are all scabrous. The carpus and hand are armed seriatly with oblong tubercles, which are rough with spinules. The tarsus is spinulous near the extremity; but more posteriorly, the spinules are setæ more or less setulose, and the hairs of the legs have a rough look, from their setulose character.

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#### FAMILY CHLORODINÆ.

THE genera in this family run parallel with those of the subfamily Xanthinæ. Thus *Zozymus* is allied to *Atergatis*, *Carpilodes* to *Carpilius* or *Liomera*, *Etisus* to *Cancer* (in part), *Actæodes* to *Actæa*, *Chlorodius* to *Xantho*, *Pilodius* to *Xanthodes*, *Cyclodius* to *Medæus*. In some instances it is difficult to decide whether the fingers should be described as pointed or excavate, the transitions are so gradual. It is obvious, therefore, that the allied genera of the two groups might be arranged in a single group. Yet the relations of the series are best shown by placing them in distinct divisions, so that they may be viewed in their true parallel relations.

*Etisus* is the only known genus in this family, in which the moveable part of the outer antennæ is excluded from the orbital hiatus, a process from the first joint filling this hiatus.

#### GENUS ETISUS, *Leach*.

In the following species of this genus, the carapax is more or less areolate, the medial and lateral regions being subdivided, and in some instances also the posterior. The lateral areolets become less distinct with age, and in the adult *Etisus levimanus*, are indicated only by undulations of the surface, although well marked in an individual not



fully grown. The front is four-lobed, the two outer lobes adjoining the eyes short, the two inner long and either straight or arcuate in outline. The antero-lateral margin has the five teeth D, E, N, T, S, and in the *E. levimanus*, one or more smaller teeth appear between N and T, and T and S.

The genus includes two groups—one having the arm long and much exsert beyond the carapax, the carapax quite broad and not deeply areolate;—the other with the arm short and little exsert, if at all, the carapax narrow, and in these and other characters approaching Actæodes. This second group may be named ETISODES.

#### ETISUS DEFLEXUS.

*Carapax leviter bene areolatus, lævis, fronte inter-antennali 4-lobato, tenui, valde deflexo, setigero; margine antero-laterali 5-dentato, dentibus subacutis, secundo minore. Pedes antici sat longi, manu carpoque extus supraque bene granulosis, digitis lævibus; reliqui angusti, valde pilosi. Abdomen maris 5-articulatum, eoque levimani simile.*

Carapax distinctly but lightly areolate, smooth, front between outer antennæ four-lobed, thin, much deflexed, setigerous, antero-lateral margin five-toothed, teeth subacute, second smaller than the others. Anterior feet rather long, hand and carpus with the outer and upper surface neatly granulous, fingers smooth; following feet narrow, very pilose. Abdomen of *male* five-jointed and like that of *levimanus*.

Plate 9, fig. 2 *a*, male, enlarged two diameters; *b*, under view of front; *c*, front view of front, showing its deflexed character; *d*, right arm, enlarged two diameters; *d'*, hand of same, outer view; *e*, left arm, enlarged two diameters; *f*, leg of second or third pair, *ibid.*; *g*, outer maxilliped, *ibid.*; *h*, abdomen of male, *ibid.*

Feejee Islands.

Length of carapax, six lines; breadth, nine and a half lines; ratio of length to breadth, 1:1.6. The deflexed front with its sinuous or four-lobed margin between the antennæ, and the granulous hands are

characteristic. The posterior outline of the deflexed portion is nearly straight, except either side, and is neatly set with rounded granules; and there are a few short transverse rows of such granules on areolets 1 M, 2 M, and some other parts. The posterior legs are quite hairy. The inner margin of the arm is fringed with hairs, and the flattened surface under the sides of the carapax is covered with short hairs, as well as the under surface of the body, against which it rubs in its motions. The interval in the orbital margin filled by a process from the base of the outer antennæ is rather broad. The margin of the front inside of the antennæ (the outer of the inter-antennary lobes of the front), projects horizontally considerably beyond the insertion of the moveable part of these antennæ.

The specimen, an alcoholic one, has a pale brown colour, and the fingers are also brown, showing that they were not originally black.

*ETISUS DENTATUS* (*Herbst*), *Edwards*.

Plate 10, fig. 2 *a*, male, from Feejees, natural size; *b*, abdomen of male.

Feejee Islands; also Balabac Passage, north of Borneo.

The Feejee specimen measured five and one-fourth inches in greatest breadth of carapax, and three and one-eighth inches in length of same. The colour was a maroon brown; of fingers, chestnut brown, excepting tips, which were white. Eight posterior legs with both margins densely pilose in one or two ranges, the hairs deep red; tarsi with shorter tufts also on the sides, claw of tarsus black. Abdomen of male seven-jointed, last segment half shorter than penult. Antero-lateral margin of carapax nine-toothed, one of these the post-orbital. The fourth and fifth, and seventh and eighth, smaller than the intermediate.

*Cancer dentatus*, HERBST, i. 186, pl. 11, fig. 66.

*Etisus dentatus*, EDWARDS, Crust., i. 411.

*ETISUS LEVIMANUS* (*Randall*).

*Carapax latus, leviter bene areolatus, lævis, fronte inter-antennali fere*



*recto, tenui, non deflexo, margine antero-laterali latè 5-dentato, dentibus brevibus, secundo valde obtuso. Pedes antici crassi, manu extus supraque lævi; reliqui compressi, marginibus pilosi, articulis quarto quinto et præcipue sexto (tarso) dorsum spinuloso-granulatis. Abdomen maris 5-articulatum articulo tertio triplici, quarto paulo oblongo, quinto triangulato, obtuso; feminæ 7-articulatum.*

Carapax broad, distinctly but lightly areolate, front between the outer antennæ nearly straight, thin, not deflexed; antero-lateral margin with five broad teeth, teeth not very prominent, the second very obtuse. Anterior feet stout, hand on upper and outer sides smooth; following pairs of feet compressed, margins fringed with hairs, fourth, fifth, and especially sixth joint spinuloso-granulate above. Abdomen of male five-jointed, third segment consisting of three normal segments, fourth a little oblong, rectangular, fifth (last) triangular, obtuse; of female, seven-jointed.

Plate 10, fig. 1 *a*, male, natural size, from the Feejees; *b*, hand, left side, natural size; *c*, hand of a smaller individual, natural size; *d*, abdomen; *e*, female abdomen, natural size. Figure 1 *f*, young female, natural size; *g*, hand, much enlarged; *g'*, same, natural size; *h*, abdomen, natural size.

Reefs of Feejee Islands; also Sandwich Islands.

Length of carapax of large specimen, one inch and seven lines; greatest breadth, two inches and seven lines; ratio of length to breadth, 1:1.6. Of another specimen, the female from which fig. *e* was taken, length, nine and one-fourth lines; greatest breadth, fourteen lines, and ratio, 1:1.52. The posterior region of carapax is nearly even. The two teeth T and S are somewhat prominent and subacute, even in the adult, and more prominent in young individuals. E and N, are obtuse in adults, and N, always so in the young. The front is lamellar and projecting. The arcolets 2 L, 3 L, 4 L are distinct, except in full-grown adults; 2 F is hardly seen. The insertion of the outer antennæ is in the notch between the outer and inner lobes of the front, and the inner lobe adjoining it projects forward considerably beyond the insertion. In the large specimen, the fingers have



each a rounded tooth on the inner margin, and no other dentation. In a small individual, ten lines long, otherwise similar, the fingers have each three subacute teeth on the inner margin.

The female abdomen is elliptical, with the penult joint longer than either the preceding or the following.

Figures 1*f, g, h*, pl. 10, represent a young female of this species. The outline is more fully semicircular in front, and the lateral angles are hardly as prominent. There is a slender but strong sulcature on the outer side of the dorsal margin of the moveable finger, and another below on the thumb, both of which are obsolescent in adults; the teeth of the fingers are as in the small specimen of the male alluded to, each finger having three teeth. The abdomen is broadest at the third joint, and from this, narrows somewhat towards the apex; the penult segment is the longest.

Length of carapax, six lines; greatest breadth, eight and three-fourths lines; ratio of length to breadth, 1 : 1.46.

*Etisus lævimanus*, Jour. Acad. Nat. Sci. Philadelphia, viii. 115.

#### ETISODES FRONTALIS.

*Carapax vix nitidus, minus transversus; antice areolatus, postice planus, areolis fere planis, areolâ 2M simplice; fronte producto, horizontali; margine antero-laterali 5-dentato, dentibus subtriangulatis, dente posteriore (S) minore. Pedes antici inermes, manu supra non lævi, digito mobili supra fere tricarinato, carpo granuloso, prope articulationem manus prominente. Pedes 8 postici paulo pubescentes, articulo tertio inermi.*

Carapax less transverse in form than in preceding species, hardly shining; anteriorly areolate, posteriorly plane, areolets nearly flat, 2M simple; front much produced, horizontal; antero-lateral margin 5-toothed, teeth subtriangular, posterior tooth (S) much smaller than preceding. Anterior feet unarmed, hand not smooth above, moveable finger somewhat tricarinate above; carpus granulous, and having a prominence adjoining the articulation with the hand. Eight posterior feet somewhat pubescent, third joint unarmed.



Plate 9, fig. 3 *a*, animal, enlarged four diameters; *b*, under view of front; *c*, outer maxilliped; *d*, extremity of abdomen.

Sooloo Sea, from a small island off the harbour of the principal Sooloo island.

Length of carapax, three lines; greatest breadth, three and three-fourths lines; ratio of length to breadth, 1 : 1.25.

The species is narrow for its length, and has the last of the teeth on the margin less prominent than the preceding. Moreover, the front is very projecting. The carapax appears granulous over the antero-lateral areolets and also anteriorly, and some interrupted lines of granules or depressions corresponding, are observed on the medial areolets. The inner orbital fissure is quite small, and the process from the base of the outer antennæ is so small, that without care the species might be taken for a *Chlorodius*, from which genus it is, however, distinct in the straight anterior margin to the third joint of the outer maxillipeds.

#### ETISODES CÆLATUS.

*Carapax valde convexus et areolatus, areolis tuberculiformibus, parce granulosus, areolâ 2 M longitudinaliter subdivisâ, 3 M tripartita, 4 M tripartita, 1 P et 2 P, valde disjunctis et bene circumscriptis, transversis; fronte inter-antennali 4-lobato, lobis externis parvulis, non salientibus; margine antero-laterali 5-dentato, dentibus obtusis. Pedes antichi sat crassi, carpo tuberculoso, manu extus seriatim spinulosâ, aut spinulo-tuberculosâ, digito supra spinuloso. Pedes reliqui compressi, obsoletè pubescentes, marginibusque valde hirsuti. Abdomen feminae 7-articulatum.*

Carapax strongly convex and areolate, areolets tuberculiform, sparingly granulous, areolet 2 M longitudinally divided, 3 M and 4 M each tripartite; 1 P and 2 P strongly separated and circumscribed, narrow transverse; front between the outer antennæ four-lobed, outer lobes quite small, not salient; antero-lateral margin five-toothed, teeth obtuse. Anterior feet rather stout, carpus tuberculous, hand externally spinulous in series, or spinulo-tuberculous, moveable

finger spinulous above. Following feet compressed, surface with a hardly distinguishable pubescence, and margins set with rather stiff hairs.

Plate 9, fig. 4 *a*, female, enlarged two diameters; *b*, front view of front; *c*, right hand; *d*, female abdomen, enlarged two diameters.

Wakes Island, Pacific Ocean.

Length of carapax, ten lines; greatest breadth, fourteen lines; ratio of length to breadth, 1 : 1.4.

The areolets are all very prominent, and rounded above, with the surface, as seen under a magnifier, dotted with a few rounded granules or minute tubercles, which on areolet 1 P form the whole surface. Besides these there are more minute black dots, which appear to be minute hairs like those that form the exceedingly short pubescence of the legs. The acute points on the outer surface of the hand are in four or five series, but above they are more scattered. Areolet 1 P has a pointed prominence at middle of posterior side, and an emargination corresponding on the anterior margin. The fissure in the inner angle of the orbit is exceedingly small, and the antennary process filling it is short. The margin of the front just inside of the antennæ does not project, but it is continued downward with a nearly vertical surface.

The abdomen has a pubescent surface and ciliate edge.

#### GENUS ZOZYMUS, *Leach*.

*Carapax undique convexus, margine antero-laterali tenui, cum angulo post-orbitali coalito. Pedes 8 postici valde compressi, articulis acie acutâ supra instructis. Habitu Atergati Actææque affinis.*

Carapax convex in every direction; antero-lateral margin thin and terminating anteriorly in the outer angle of the orbit. Eight posterior feet much compressed, joints thin and having an acute edge above. In habit, resembling Atergatis and Actæa.

The type of *Zozymus* of Leach, as well as *Ægle* of De Haan, is the *Zozymus æneus*, in which the legs are cristate; and the genus is here



restricted to species having this cristate character, as was done by De Haan, but excluding such of De Haan's species as have not spoon-shaped fingers.

ZOZYMUS GEMMULA.

*Carapax nudus, non granulatus, nitidus, anticè bene areolatus, areolis paulo monticulosus, 1 M, 2 M, discretis, 2 M subdivisâ, fronte fere recto, emarginato, margine antero-laterali tenui, leviter 4-lobato, lobis tribus posticis fere æquis. Pedes antici æqui, non carinati, manu carpoque tuberculatis, tuberculis cum granulis acervatis instructis; manu extus partim seriatim granulâtâ. Pedes 8 postici bene carinati, carinâ articulorum 3tii 4ti prope apicem profundè incisâ, tarso sparsim hirsuto.*

Carapax naked, not granulate, shining, anteriorly distinctly areolate, areolets a little monticulose, 1 M, 2 M, distinct, 2 M subdivided; front nearly straight, emarginate, antero-lateral margin thin, faintly four-lobed, three posterior lobes nearly equal. Anterior feet equal, not carinate, hand and carpus tuberculate, tubercles made of aggregated granules, outer surface of hand in part seriate with granules. Eight posterior feet neatly carinate, carina of third and fourth joints near apex profoundly incised; tarsus sparsely hirsute.

Plate 9, fig. 6 *a*, outline of antero-lateral margin, magnified four diameters; *b*, front view of part of front, showing part of base of outer antennæ; *c*, outer view of right hand; *d*, posterior leg.

Shores of a small island off the principal harbour of Sooloo.

Length of carapax, 2.6 lines; greatest breadth, 3.9 lines; ratio of length to breadth, 1:1.5. The areolets are somewhat marked with interrupted cross lines, sometimes crenulate, and in some parts of the antero-lateral the surface consists of low points. The lobes of the antero-lateral margin are separated by a minute fissure, and are but slightly prominent. Between the beaded tubercles of the hands and carpus there is a slight imperfect velvety appearance. The third joint of the posterior legs is naked, except two or three hairs at apex, and the following joint is nearly the same; the fifth has some short hairs

both above and below. The abdomen has a naked margin. The fingers have a spoon-shape extremity, the margin being very thin; in the lower the apical margin is slightly concave, and the extremity of the upper finger, which is somewhat acuminate, shuts against the concavity.

ZOZYMUS LÆVIS.

*Carapax latus, lævis, paulo nitidus, areolis plerumque obsoletis, 2 L et 1 M prominulis, margine antero-laterali dilatato et tenui, obsoletè 2-3-lobato, dente nullo. Pedes antici æqui, inermes, manu latâ, supra rotundatâ, digitis canaliculatis, bene 4-dentatis, dentibus tenuibus, digito mobili valde uncinato. Pedes postici subcristati fere nudi.*

Carapax broad, smooth, somewhat shining, areolets mostly obsolete, 2 F and 1 M a little distinct, antero-lateral margin dilatate, thin, obsoletely two to three-lobed, but without teeth. Anterior feet equal, unarmed, hand broad, rounded above, fingers channeled, each neatly four-toothed, the teeth thin, moveable finger strongly uncinuate. Posterior feet subcristate, nearly naked.

Plate 9, fig. 5 *a*, male, enlarged two diameters; *b*, outer maxilliped; *c*, fingers of hand, outer view.

Balabac Passage.

Length of carapax, 5.1 lines; greatest breadth, nine lines; ratio of length to breadth, 1 : 1.75. The surface of the carapax shows traces of the areolets towards the front and antero-lateral margin. The appearance of two lobes in the antero-lateral margin is distinct but faint, but the subdivision of the anterior of the lobes into two others is less obvious, though visible in the bending of the outline. The postero-lateral side is rounded. The eye has a thin, prominent orbit, which is quite entire, and when shut back lies deep within, not projecting at all above the outline. The outer surface of the hand is a little uneven. The fingers touch only at apex, the moveable finger being very strongly uncinuate, so that the extremity of the short hand may be said to be broad truncate. The carpus has the inner margin thin. The posterior legs are very thin, with a trenchant upper margin to the joints. The male abdomen consists of five segments.



ZOZYMUS ÆNEUS (*Linn.*), *Leach.*

Plate 10, fig. 3 *a*, animal, natural size.

Islands of the Paumotu Archipelago, Samoan Islands, and East Indies.

This widely-distributed species, when alive, is exceedingly beautiful, and very unlike in its tints the figures hitherto published. The figure by Quoy and Gaimard, in Freycinet's Voyage (Plate 76, fig. 1), is evidently from a dead specimen, the colouring being very much faded and altered. The subdivisions of the areolets are somewhat remarkable. 2 M is divided longitudinally nearly through, and from the anterior end of each part a segment is cut off. 5 L is divided into two parts, and each portion is again partly divided. 3 M is divided almost completely into three parts, and from each lateral segment a small subareolet is separated anteriorly; 4 M is united to 3 M between the two intermediate punctures. 1 P consists of four or more parts, two anterior either side of the medial line (sometimes subdivided), and two posterior on the medial line, the former of these triangular and lengthened anteriorly, the latter small and suboval. 2 O has a small tubercle at its base, and the same is true of 3 O.

The spoon-cavity of the fingers is not circumscribed on the inner side.

*Cancer æneus*, LINN., Mus. Lud. Ulr., 451; Fabr. Supp., 335.

*Zozymus æneus*, LEACH; DESMAREST, 105; EDW., i., 3830.

*Ægle æneus*, DE HAAN, Faun. Japon., 17.

GENUS CARPILODES, *Dana.*

*Carapax latus, undique convexus, nudus, marginibus crassè rotundatis. Pedes nudi, fere læves et subcylindrici. Aliis Zozyimo similis; Carpilio, Liomeræque habitu affinis.*

Carapax broad, convex in different directions, nude, margins stout and rounded. Feet naked, nearly or quite smooth and subcylindrical. In other characters like *Zozymus*; in habit near *Carpilius* and *Liomera*.

The species referred to this genus would fall in with *Liomera*, were it not for the form of the fingers, in which respect they are like the *Zozymi*. *Xantho obtusus* of De Haan, pl. 13, f. 5, appears to be included.

## CARPILODES TRISTIS.

*Carapax latior, latè subrhombicus, lævis, non nitidus, anticè sat areolatus, areolis 1 M 2 M conjunctis, 2 L 3 L conjunctis, 4 L 5 L 6 L conjunctis; fronte brevi, fere recto, levissime emarginato; margine antero-laterali 4-lobato, lobis rotundatis; latere postero-laterali recto, convexo. Pedes antici æqui, breves et parvi, nudi et inermes, læves. Pedes postici vix compressi, nudi.*

Carapax broad subrhombic, smooth, not shining, somewhat areolate anteriorly, areoles 1 M and 2 M united, so also 2 L and 3 L, and also 4 L, 5 L, 6 L; front short, almost straight, very slightly emarginate, antero-lateral margin four-lobed, lobes rounded; postero-lateral side straight, convex. Anterior feet equal, short and small, naked and unarmed, smooth. Posterior feet hardly at all compressed, naked.

Plate 9, fig. 7 *a*, female, natural size; *b*, front view of front, showing outer antennæ, enlarged; *c*, outer maxilliped; *d*, female abdomen, natural size.

Paumotu Archipelago?

Length of carapax, 6·15 lines; greatest breadth, 10·5 lines; ratio of length to breadth, 1:1·7. The surface has a smooth, dull look, and the furrows though neat are not deep. The fingers are channeled, and the hand is seen to have the outer surface a little uneven when magnified. The antero-lateral sides are nearly parallel to the diagonally opposite postero-lateral, and this gives an approach to a rhombic form to the outline. The base of the outer antennæ is continued to the same height as the outline of the orbit.

## GENUS ACTÆODES, Dana.

*Carapax postice fere planus, versus margines anticum antero-lateralemque*



*curvatim declivis. Digiti instar cochlearis excavati. Pedes 8 postici articulo 3tio non cristati.*

Carapax posteriorly flat or nearly so, towards the anterior and antero-lateral margins curvately inclined. Fingers excavate spoon-like. Eight posterior feet not having the third joint cristate.

These species are like *Actææ* in form and aspect, but the fingers are those of the *Chlorodinæ*. The front and sides curve downward, and the outline in a vertical view is a regular semicircular arc. Moreover, the species are often granulous as in *Actæa*, and the two genera pass into one another by insensible gradations. The granulous species graduate into those that are nearly smooth, or are granulous only anteriorly and laterally, and also, into other species that have a cellular surface. Some species have the fourth or fifth joints of the posterior legs more or less cristate, but not the third, like the *Zozymi*.

This genus includes *Zozymus* in part, of Edwards. The *Z. tomentosus* may be considered its type.

1. *Carapax lævis sive vix granulatus, nec tomentosus.*

ACTÆODES AREOLATUS.

*Carapax bene areolatus, lævis, areolâ 2 M simplice, 1 R, 3 R discretis, 1 P vix circumscriptâ; margine frontali fere recto, emarginato; margine antero-laterali 5-dentato, dente quinto parce minore. Pedes antici æqui, manu extus parce rugatâ, digitis canaliculatis, 2-3-dentatis, digito mobili valde uncinato. Pedes postici paulo nudi, articulis compressis, tertio supra fere acuto.*

Carapax areolate, smooth, areolet 2 M simple, 1 R and 3 R separate, 1 P hardly circumscribed; frontal margin nearly straight, emarginate, antero-lateral margin five-toothed, fifth tooth the smallest. Anterior feet equal, outer surface of hand hardly rugate, fingers channeled, 2-3-dentate, moveable finger strongly uncinuate. Posterior feet nearly naked, joints compressed, the third nearly acute above.

Plate 9, fig. 8 *a*, outline of antero-lateral margin, enlarged; *b*, hand,

enlarged; *c*, front view of front, showing outer antennæ; *d*, male abdomen.

Raraka Island, Paumotu Archipelago.

Length of carapax, two and one-fourth lines; greatest breadth, three lines; ratio of length to breadth, 1:1.33. The surface is a little shining and not granulous under the microscope. The areolets are quite distinct and convex, and the furrows neatly pronounced. 2M is lobed anteriorly, though not subdivided throughout. All the normal antero-lateral areolets are present, and the posterior are partly distinct.

#### ACTÆODES FABA.

*Carapax transverso-ellipticus, valde convexus, non granulosus, anticè bene areolatus, regione posticâ simplicissimâ cum regione postero-laterali coalitâ, areolâ 2M fere bisectâ, areolis 2L 3L coalitis, superficie areolarum depressâ; fronte interantennali fere recto, medium parce emarginato, margine antero-laterali parce expanso, 5-angulato aut obsoletè 5-dentato. Pedes antiqui mediocres, carpo manuque subtiliter erosis et interdum areolatis, digitis inermibus. Pedes 8 sequentes fere nudi, compressi, articulo tertio supra paulo carinato, articulis quarto quintoque paulo granulosus. Abdomen maris 5-articulatum, feminae 7-articulatum, nudum præter marginem ciliatum.*

Carapax transverse-elliptical, very convex, not granulous, anteriorly neat areolate, posterior region undivided and coalesced with the postero-lateral; areolet 2M nearly bisected, 2L and 3L coalesced, surface of areolets flattened, front between outer antennæ very nearly straight, sparingly emarginate at middle, antero-lateral margin slightly extended, five-angled or obsoletely five-toothed. Anterior feet of moderate size, carpus and hand minutely erose, and sometimes areolate with granules, fingers unarmed. Following eight feet nearly naked, compressed, third joint somewhat carinate above, fourth and fifth joints a little granulous above. Abdomen of *male* five-jointed, of *female* seven-jointed, naked except the edge, which is ciliate.



Plate 11, fig. 1, female, enlarged four diameters.

Cape Verdes? Atlantic Ocean.

Length of carapax, three and one-fourth lines; breadth, five lines; ratio of length to breadth, 1:1.5. The male specimen in the collections has the surface smooth, while in the two females the lens discloses a fine granulation over the anterior part of the surface. The channeling is neat and distinct; moreover, in the female the arm and hand above are areolate, rugose and granulous, and in the male only corrugate. The antero-lateral margin is thin. Behind the posterior tooth, the margin is arcuate but entire. The abdomen of the female is obtuse at extremity, or very slightly emarginate; that of the male is narrow, as in *A. tomentosus*.

It is possible that the male specimen belongs to a distinct species; yet the character of the antero-lateral margin, and the general proportions of the body and also of the hands, are the same in the two.

#### ACTÆODES BELLUS.

*Carapax latior, anticè bene arcuatus, non nitidus, lævis, anticè et latera-liter subtilissimè granulosus, anticè areolatus, sulcis angustis, areolis 1 M 2 M conjunctis, 4 L 5 L 6 L et regione postero-laterali totis conjunctis; fronte fere recto, emarginato; margine antero-laterali crasso, 4-lobato, lobis 3 posticis dentiformibus, obtusis. Pedes antici æqui, manu supra rotundatâ extus subtiliter granulosâ et granulis partim seriatis, digitis canaliculatis, carpo intus obtuso. Pedes 8 postici sat compressi, fere nudi.*

Carapax quite broad, anteriorly neat arcuate, not shining, smooth, anteriorly and laterally very fine granulous, anteriorly areolate, sulci narrow, areolets 1 M and 2 M united, 4 L, 5 L, and 6 L, and all the postero-lateral region, coalescent; front nearly straight, emarginate; antero-lateral margin stout, four-lobed, three posterior lobes rounded, dentiform, obtuse. Anterior feet equal, hand above rounded, exteriorly very fine granulous, and granules partly seriate, fingers channeled, carpus obtuse within. Eight posterior feet much compressed, nearly naked.

Plate 11, fig. 2, animal, enlarged three diameters.

Tutuila and Upolu, Samoan Group, and Wakes Island Pacific; also Paumotu Archipelago?

Colour purplish red, or deep red. Length of carapax in one specimen (male), 2.9 lines; greatest breadth, 4.8 lines; ratio of length to breadth, 1 : 1.66; in another specimen (female), length  $3\frac{1}{2}$  lines; breadth,  $5\frac{1}{2}$  lines; ratio, 1 : 1.65. This is a very neat, smooth-looking species, with narrow, even furrows between the areolets. Under a lens, the anterior part of the carapax is decidedly granulous, and somewhat uneven, and the hands and carpus are similarly granulous, the granules on the outer surface of the hands partly in series.

2. *Carapax granulatus aut tomentosus.*

ACTÆODES TOMENTOSUS (*Edwards*), *Dana*.

From the Samoa and Feejee Islands, Pacific Ocean; also from the Sooloo Sea, East Indies, and the Mangsi Islands.

In this species, areolet 2 M is longitudinally divided into two nearly equal parts, each showing, through the tomentose covering, about a dozen points or minute tubercles having a smooth surface; areolet 3 M is divided into three parts, the narrow anterior portion being one, and the rest being medially bisected; areolets 1 L, 2, 3, 4, 5, 6, are all distinct and simple, and 2 L is nearly of the same size as either half of 2 M. 1 P and 2 P are oblong transverse and rather broad, and separated by a depression. 1 R, 2 R are simple, the former about twice as large as the latter, yet in small specimens they appear coalesced.

The whole under surface of the body has a tomentose coat like the upper, and it covers densely the outer maxillipeds, which are coarse granulous. The fingers of the hand are enveloped by it nearly to the tips, beside being very closely set with minute points.

ACTÆODES AFFINIS.

A tomentoso areolis fere similis, areolâ cardiacâ fere bisectâ; carapax



*paulo angustior, minutius granulosis parce tomentosus. Margo antero-lateralis 4-dentatus. Digiti manus spinulosi, spinulis majoribus quam in tomentosus et paucioribus. Maxillipedes externi nudi, laeves. Abdomen sparsim pubescens.*

Like the *tomentosus* in areolets, but the cardiac areolet nearly bisected; carapax a little narrower, more minutely granulous, sparingly tomentose. Antero-lateral margin 4-dentate. Finger of hand spinulous, spinules larger and fewer than in the *tomentosus*. Outer maxillipeds naked, smooth. Abdomen sparsely pubescent.

Plate 11, fig. 3, cardiac areolet, enlarged two diameters.

Probably from the Paumotu or Society Islands.

Length of carapax, five and a half lines; breadth, seven and a half lines; ratio, 1 : 1.37.

This species has not the tomentose outer maxillipeds of the *tomentosus*, nor the unarmed fingers of the *rugatus*, besides differing in other particulars. On either half of the cardiac areolet near forty granules may be counted, while there are hardly a dozen in the *tomentosus*. The inferior surface of the hand is naked and mostly smooth.

#### ACTÆODES SPECIOSUS.

*Carapax paulo angustior, undique granulosis, fere nudus, pilis interstitialibus brevioribus quam granuli, anticè bene areolatus, sulcis perangustis, subtiliter tomentosus, areolis planis, areolâ 2 M partim subdivisâ, 3 M tripartitâ, margine antero-laterali bene 4-lobato, postero-laterali concavo, brevi. Pedes toti omnino granulosis et fere nudi, marginibus non ciliati, manu carpoque superficie irregulariter areolatis; manu granulosis seriatis extus ornatâ, digitis perbrevibus, malè excavatis, digito mobili clauso fere verticali; articulo quarto pedum 2di 3tii 4ti superficie tripartito.*

Carapax rather narrow, granulous throughout, nearly naked, interstitial hairs shorter than the granules, anteriorly regularly areolate,

the sulci very narrow, minutely tomentose, areolets flat, 2 M partly subdivided, 3 M tripartite, antero-lateral margin four-lobed, postero-lateral concave and short. Feet all granulous and nearly naked, margins not ciliate, hand and carpus with the surface irregularly areolate, outer surface of hand with the granules seriate, fingers very short, imperfectly excavate, moveable finger when shut having nearly a vertical position; fourth joint of second, third, and fourth feet with the surface tripartite.

Plate 11, fig. 4 *a*, male, enlarged three diameters; *b*, right hand; *c*, male abdomen.

Tutuila, Samoa Group, Pacific.

Length of carapax of male, 3.66 lines; greatest breadth, 5 lines; ratio of length to breadth, 1:1.37. The carapax has a bare look, as the pubescence between the sulci and between the granules is very short, even shorter than the granules, and the granules of the areolets are very crowded. The surface of the areolets is flat, and the sulci very narrow. Areolet 2 M is divided about half way through. The upper surface of the hand is a little broad, and is divided obliquely by a depression, and a parallel depression extends from the hinder margin of the same surface. The outer surface of the carpus is divided into three parts by vertical depressions, and there is an imperfect longitudinal depression above. The moveable finger has some granules on its upper side, so also the under surface of the hand; and similar granules cover the under side of the third joint of the four posterior legs. The outer maxillipeds are naked on the outer surface or nearly so; the sternum is in part slightly villous. The tarsus is very short and stout, and granulous, with a slender claw.

#### ACTÆODES CAVIPES.

*Carapax latior, infra omnino villosus, supra fere nudus, granulosus, omnino areolatus, sulcis nudis aut vix tomentosis, areolis minutè granulosis, valde convexis et paulo irregularibus, 2 M subdivisâ, 3 M tripartitâ, margine antero-laterali irregulariter 5-dentato. Pedes granulosi; antici subœqui, manu carpoque partim granulosis et superficie*



*cavernosis, manu extus seriato-granulosâ, subtiliter tomentosâ, digitis malè excavatis, scabris, striatis, partim subtiliter tomentosis; postici paulo hirsuti, articulis 4to 5toque supra valde cristato, cristâ integrâ, lunulatâ, sublaterali, hac cristâ et margine pedis superno cavitatem grandem includentibus.*

Carapax quite broad, below villous throughout, above granulous, nearly naked, throughout areolate, sulci naked or hardly tomentose, areolets minutely granulous, very convex, and a little irregular, 2 M subdivided, 3 M tripartite, antero-lateral margin irregularly five-toothed. Feet granulous; anterior subequal, hand and carpus in part granulous, and with deep cavernous excavations, hand seriato-granulous on outer surface, finely tomentose, fingers imperfectly excavate, scabrous, striate, in part minute tomentose; posterior legs a little hirsute, third and fourth joints above strongly cristate, crest entire, lunulate, sublateral, this crest and the upper margin of the feet including a large cavity.

Plate 11, fig. 5 *a*, female, enlarged two diameters; *b*, right hand.

Feejees; also Upolu, Samoan Group.

Length of carapax of a female, five lines; greatest breadth, seven and three-fourths lines; ratio of length to breadth, 1:1.55; a smaller female, length, three and three-fourths lines; breadth, five and three-fourths lines; ratio, 1:1.53. In the larger specimen, the sulci are rather broad and naked or nearly so, and the areolets are very prominent and gibbous. In the smaller, the sulci are quite narrow, the granules extending nearly to meeting from the opposite sides. In neither are there any hairs on the carapax longer than the granules, and but slight traces of any villosity can be detected. The cristate posterior legs give a peculiar look to the species, the crest being curved and sublateral, and enclosing between it and the upper margin of the leg, an oblong cavity. The anterior legs have pits or cavities excavated in the upper part of the hand, and in the outer surface of the carpus. In the smaller specimens the eight posterior legs are not as hirsute as in the larger one, being but slightly so. The outer maxillipeds, pterygostomial region, sternum and abdomen are all short hirsute. The fingers are not very perfectly spoon-shaped. The

granules of the hand extend over its under surface. This species forms a passage to *Actæa cellulosa*.

## ACTÆODES SPONGIOSUS.

*Carapax posticè vix areolatus, areolâ 2 M subdivisâ, superficie, sulcis excéptis, breviter et rigidè velutinâ, aspectu spongiosâ; margine antero-laterali simplicissimè 5-dentato, dentibus gracilibus, acutis. Pedes breviter rigidèque pubescentes, antici paulo armati.*

Carapax posteriorly hardly areolate, areolet 2 M subdivided, surface with a very short, rigid covering of setules, giving it a spongy appearance; antero-lateral margin with five simple, slender acute teeth. Feet with a short stiff pubescence, anterior pair somewhat armed on upper side with small pointed tubercles.

Plate 11, fig. 6 *a*, carapax, enlarged four diameters; *b*, front view of front; *c*, profile of front part of carapax, as seen in a direct side view, *m* being the front edge.

Sooloo Sea, or Balabac Passage.

Length of carapax, two and one-third lines; greatest breadth, three and a half lines.

This species has much the aspect of a *Pilodius*, though somewhat more convex. Like the *A. tomentosus*, the areolet 2 M is divided longitudinally, and the peculiar stiff and close setules of the surface, looking like a spongy covering, are confined to the surface of the areolets, and do not occur in the intermediate furrows. The front adjoining the front margin (areolet 1 F), is nearly vertical. The margin posterior to tooth S is not rounded, but instead is nearly straight, as in *Pilodius*.

## APPENDIX.—ACTÆODES? INTEGERRIMUS.

*Carapax convexus, lævis, anticè leviter areolatus, margine antero-laterali integro, non dilatato. Pedes antici inermes, manu extus scabrâ, supra*



*rotundatâ, carpo intus uni-angulato; postici paulo compressi, inermes, pubescentes.*

Carapax convex, smooth, anteriorly faint areolate, antero-lateral margin entire, not dilatate. Anterior feet unarmed, hand scabrous without, rounded above, carpus with an angle on inner side; posterior feet somewhat compressed, unarmed, pubescent.

Plate 11, fig. 7, animal, enlarged four diameters.

Oahu or Maui, Sandwich Islands.

Length of carapax, one and three-fourths lines; greatest breadth, two and a half lines. The specimen is evidently a young individual. The carapax has some scattered short hairs, giving it a ragged look, and the hairs of the legs are similarly irregular. The carpus and hand are partly pubescent.

#### GENUS DAIRA, *De Haan.*

The deep emargination in the anterior margin of the outer maxillipeds in *Daira*, by which it is especially distinguished, is the aperture for the efferent channel from the branchiæ. Although so distinct in the common species, the same character, less strongly marked, is found in some *Chlorodii*; and the species *nodosus*, instituted by Dr. Randall (*J. Acad. Nat. Sci. Philad.*, viii. 111), appears to be more properly a *Chlorodius*.

*Daira*, DE HAAN, *Faun. Japon.*, 18, 1833.

*Lagostoma*, EDWARDS, *Crust.*, i. 386, 1834.

#### DAIRA VARIOLOSA (*Fabr.*), *Dana.*

*Carapax valde convexus, nitidus, baccato-tuberculosus tuberculis pisiformibus, fronte inter-antennali bilobato, lobis salientibus, margine laterali et antero-laterali 13-14-denticulato. Pedes antici tuberculati, manu brevi, digito mobili spino-tuberculato. Pedes octo sequentes compressi*

*valde armati et dorsum densè pilosi, tarso infra supraque spinoso et infra ad medium duo penecilla setarum ferente.*

Carapax very convex, baccato-tuberculous, the tubercles large pisi-form; front between outer antennæ two-lobed, lobes prominent; lateral and antero-lateral margin 13-14-denticulate. Anterior feet tuberculate, hand short, moveable finger spino-tuberculate. Following four pairs of feet compressed, strongly armed, and above densely pilose, tarsus above and below spinous, and having below, near middle, two tufts of setæ.

Plate 10, fig. 4 *a*, carapax, coloured to show the relation of the tubercles to the areolets; *b*, leg of fourth pair; *c*, hand, first pair, left side, natural size; *d*, abdomen, natural size.

Upolu, Samoan Islands, Pacific Ocean.

Length of carapax, one inch one and a half lines; breadth, one inch and seven lines; ratio of length to breadth, 1:1.4; length of hand, about ten lines; of carpus, six lines.

The relation of the tubercles to the normal areolets is shown in the figure. 2 F consists of two tubercles placed transversely; 1 M of one tubercle; 2 M of seven in two longitudinal rows, the inner of three, the outer of four; 1 L of one; 2 L of two; 3 L and 4 L each of one; 5 L of three; 6 L of three, one of them much smaller than the others.

The teeth of the margin are increased beyond the number five by intermediate teeth, which are a little smaller than the others, and also by a prolongation of the dentate margin backward. In the intervals D, E, and E, N, there is one intermediate tooth, and in the interval N, T, and T, S, two intermediate each, so that the teeth are as follows, representing the supernumerary by dots, D . E . N . . T . . S.

Beyond S, posteriorly there are two prominent teeth, the first of which is separated from S by two denticulations; but these teeth are proper tubercles, and the line is continued backward, upon the surface by two or three tubercles. The upper margin of the hand consists of four large tubercles; and the outer surface has the tubercles short conical and seriate. The tarsus has two dorsal rows of spines, two or three in a series often on the outer surface, and two or three on the inferior side. The preceding joint is hardly longer than broad. The



dorsal spines are in two series of two or three each; besides which there are two or three below towards apex, and others on the outer surface, which are obsolescent except in the fifth pair.

*Cancer perlatus*, HERBST, i. 265, pl. 21, f. 122.

*Cancer daïra*, HERBST, iii. pl. 53, f. 2.

*Cancer variolosus*, FABR., Supp., 338.

*Lagostoma perlata*, EDWARDS, Crust., i. 387.

*Cancer (Daïra) perlatus*, DE HAAN, Faun. Japon., 18.

As the word *perlatus* in Latin signifies very broad, and not pearly, as intended by it, we have rejected it for *variolosus* of Fabricius.

#### GENUS CHLORODIUS, Leach.

The carapax in the Chlorodii varies in the number of marginal teeth, either by the *subdivision* of the normal teeth, or by the *obsolescence* of some of them. The normal number *five* prevails. In the *nudipes*, each of the normal teeth consists of two or three teeth, and the whole number is thus ten or eleven; in the *sanguineus*, the number is *seven*, there being an intermediate inferior tooth between D and E, and a posterior tooth back of S; in the *niger* there are *four*, the tooth E being obsolete; and in the *cytherea* both E and S are obsolescent, though still distinguishable.

The areolation of the carapax differs widely; in some, as the *ungulatus*, all the normal areolets are very distinct, and in the *monticulosus* they are much subdivided; while in the *levissimus* all are wanting, and the surface is quite smooth. The process beneath the front adjoining the outer antennæ is broader than long, and the first joint of the outer antennæ reaches forward so as to fill very nearly the orbital hiatus. The third joint of the outer maxilliped has the anterior margin concave or emarginate, and is subrectangular in form.

The genus Chlorodius of De Haan (Faun. Japon., 13), is the same with Atelecyclus; this author, however, supposed his genus identical with Leach's when it was adopted by him.

The genera Pilodius and Cyclodius are properly subgenera along with Chlorodius, in the same manner as Xanthodes and Paraxanthus are subgenera with Xantho.

1. *Carapax antice posticeque bene areolatus, areolâ 2 M bipartitâ. Articulis pedum posticorum 3tius superne spinulosus.*

CHLORODIUS UNGULATUS, *Edwards.*

Plate 11, fig. 8 *a*, hand of common variety; *b*, same of var. *gracilis*.

Navigator Islands; Tahiti; Mangsi Islands; Balabac Passage.

*Common variety.*—Length of carapax of a male, six and two-thirds lines; breadth, nine and a half lines; ratio, 1:1.43. Colour pale or dark brown, reddish brown, usually more or less clouded or in blotches. The arms project full half their length beyond the carapax. The carpus and hand are covered by rounded flattened tubercles of small size. The areolation is very deep and the areolets not decomposed. 3 M (intramedial) is hardly subdivided into three parts. 5 L is simple, and but slightly, if at all, indented; 2 L, 3 L, 4 L are subconical in form; 1 R, 2 R and 3 R are separated by distinct sulci. The teeth are D, E, N, T, S; and upon the surface of S there is a slight prominence.

The fingers are long, and when closed there is considerable space between them. The anterior margin of the third joint of the outer maxillipeds is excavate.

Var.  $\beta$  *gracilis*.—Hand and legs more slender, the upper and lower margins of hand nearly parallel, and the lower finger somewhat reflexed; while in the common variety, the margin of the lower finger is nearly or quite in the same line with the hand, and the hand is much the broadest at the articulation with the moveable fingers.

Var.?  $\gamma$  *curtimanus*.—From Tahiti, Navigator Islands, Balabac Passage. The areolation and all the characters as in the common variety, but arms projecting but little in males as well as females.

Length of carapax of a male, 5.2 lines; breadth, 7.5 lines; ratio, 1:1.44. The surface is somewhat granulous posteriorly, and so is the sternum. Adams and White in the Crustacea of the Samarang\* have figured and described a Chlorodius, as the *C. areolatus* of Ed-

\* Page 41, pl. 11, f. 3.



wards, which much resembles our *curtimanus*. The specimens we describe differ from Edwards's *areolatus* in having the same number of antero-lateral teeth as the *ungulatus* (that is, *five* and not *four*), the posterior legs are not "presque lisses," but granulous, and the anterior legs are small tuberculous.

#### CHLORODIUS MONTICULOSUS.

*C. ungulato affinis, areolis valde distinctis, margine antero-laterali 5-dentato, fronte inter-antennali 4-lobato, pedibus 8 posticis paulo pubescentibus et supra spinulosis. Areola 2 M decomposita, 4 L plus minusve divisa. Pedes antici tuberculis parvulis subacutis armati, digito mobili inermi. Segmentum abdominis maris penultimum parce oblongum.*

Related to *ungulatus*, the areolets being very distinct and prominent, antero-lateral margin five-dentate, front between outer antennæ four-lobed, eight posterior feet pubescent and spinulous above. Areolet 2 M decompound, 4 L more or less divided. Anterior feet armed with very small pointed tubercles, moveable finger unarmed. Penult segment of male abdomen a little oblong.

Plate 11, fig. 9 *a*, male, natural size; *b*, male abdomen; *c*, hand, natural size; *d*, under view of carapax (see page 24); *e*, front view of front, showing process *p*; *f*, part of maxilliped.

Feejee Islands; Tahiti, Society Islands; Upolu, Navigator Islands; Balabac Passage north of Borneo.

Length of carapax, eight lines; greatest breadth, eleven and a half lines; ratio of length to breadth, 1:1.44. Other specimens are smaller. They are all characterized by very small pointed tubercles on the arm and hand, instead of obtuse warts like the *ungulatus*; and the areolets of the surface are usually much broken into subordinate elevations, which is especially seen in 2 M and 4 L. The young in *ungulatus* appear to resemble the *monticulosus* in the acute points of the hand; but in specimens five or six lines in length the prominences are obtuse and wart-like. The arm projects but little more than in the *curtimanus*.

*Chlorodius obscurus?* Plate 11, fig. 10 *a*, represents a front view of the hand of a *Chlorodius* from Upolu, which approaches the *monticulosus* in its areolets, but has much stouter hands and a more exsert arm, and both the hands and carpus are smooth, or with obsolete prominences. It appears to be the *Chlorodius obscurus* of Hombron and Jacquinot, Voy. au. pole Sud, pl. 3, f. 4. The specimen is ten and a half lines long; the greatest breadth, fifteen lines; ratio of length to breadth, 1 : 1.43. Another smaller specimen, eight lines long (same length as for a characteristic *C. monticulosus*), has the hand as figured in figure *c*. The fingers in the older specimen are without teeth, evidently owing to age, the disappearance being due to wear. But the absence of tubercles or spinules from the hand and carpus does not seem to be due to age. Moreover, the hand is much stouter in proportion, the width in the longer hand of a male being much greater than half the length of the carapax, while it is about equal to half the length in the *C. monticulosus*. The areolets anteriorly and posteriorly are distinct, but are not separated by as deep furrows, and are therefore less prominent. The third joint of the posterior pair of legs is less decidedly spinulose along the upper margin. The front and the lateral margins are as in the *ungulatus* and *monticulosus*. The inner margin of the carpus also projects in two low obtusish points. The male abdomen is well represented by the figure of the abdomen of *monticulosus*.

Figure 10 *b*, represents an upper view of the arm and carpus of this *Chlorodius*, of the same leg to which fig. 10 *a* belongs.

2. *Carapax anticè areolatus, posticè planus aut imperfectè divisus, areolâ 2 M non subdivisâ. Pedes antici inermes; articulus pedum 8 posticorum 3tius supra non spinulosus.*

CHLORODIUS SANGUINEUS? *Edwards.*

*Carapax non nitidus, anticè bene areolatus, posticè fere planus, areolâ 2 M non omnino divisâ, 3 M simplicissimâ, 3 L 4 L sejunctis, coalitis, fronte subtiliter emarginato, juxta antennas vix saliente, margine antero-laterali 7-dentato, dentibus subacutis, uno pone dentem S. Pedes 8 postici ad margines dense ciliati, articulo tertio valde compresso supra subacuto; manu carpoque inermibus, supra subtiliter exesis.*



Carapax not shining, neatly areolate anteriorly, posteriorly nearly plane, areolet 2 M but partly divided, 3 M quite simple, 3 L, 4 L separated; front emarginate, near antennæ scarcely salient; anterolateral margin seven-toothed, teeth subacute and prominent, one of them posterior to S. Posterior eight feet densely ciliate at margins, third joint much compressed, above subacute; hand and carpus unarmed, above minutely erose.

Plate 11, fig. 11 *a*, male, natural size; *b*, right hand, *ibid.*; *b'*, fingers of right hand of another specimen; *c*, front view of part of front, showing process *p*, &c.; *d*, part of outer maxilliped.

Feejee Islands; Waterland Island, one of the Paumotus; also Sandwich Islands, at Oahu, Maui, and at Hilo in Hawaii.

Length of carapax of largest specimen, nine lines; greatest breadth, fourteen and a half lines; ratio of length to breadth, 1 : 1.6.

The proportion of length to breadth is very closely the same as in the *nudipes*, and the anterior legs are similar in the pitted or irregular surface. The hairy margins of the eight posterior legs at once distinguish it. The teeth D, E, N, T, S have the normal character, the two supernumeraries are one just posterior to S, and another between D and E, a little below the level of these teeth. The surface of the posterior part of the carapax is very nearly even. The male abdomen is closely like that of *C. nudipes*; the penult segment is very slightly if at all oblong; the last segment is not oblong, and is rounded at apex. The areolation of the carapax is usually very distinct, as shown in the figure, though sometimes somewhat fainter.

#### CHLORODIUS EXARATUS, *Edwards.*

Pacific Ocean, but particular island doubtful.

Length of carapax, six and one-fourth lines; greatest breadth, nine and one-half lines; ratio, 1 : 1.5. The species differs from the *sanguineus* in wanting the tooth posterior to S. The areolation is similar and equally distinct.

## CHLORODIUS NUDIPES.

*Carapax non nitidus, anticè bene areolatus, posticè fere planus, areolâ 2 M non omnino divisâ, 3 L, 4 L sejunctis, 1 P, 2 P coalitis aut vix sejunctis, fronte emarginato, juxta antennas saliente, margine antero-laterali 10-11-denticulato, uno dente pone S. Pedes toti nudi; antici crassi, manu carpoque supra subtiliter exesis, carpo spinâ brevintus armato. Pedes 8 postici sat breves, articulo tertio dorsum non acuto.*

Carapax not shining, anteriorly neatly areolate, posteriorly nearly plane, areolet 2 M not divided through, 3 L, 4 L separate, 1 P, 2 P united or but faintly separate; front emarginate, near antennæ salient; antero-lateral margin 10-11-toothed, one tooth being posterior to S. Feet all naked, anterior pair stout, hand and carpus unarmed, surface finely erose above, carpus armed within with a short spine. Eight posterior feet rather short, third joint not having a sharp upper edge.

Plate 11, fig. 12 *a*, male, enlarged two diameters; *b*, abdomen, *ibid.*; *c*, part of outer maxilliped.

Mangsi Islands.

Length of carapax, four and one-half lines; greatest breadth, seven and one-fourth lines; ratio of length to breadth, 1 : 1.6. Like the preceding species, the carapax is not shining. It differs from them in having the posterior surface but very slightly depressed transversely between areas 1 P and 2 P. It is peculiar in having naked legs and an unusual number of teeth on the antero-lateral margin. The surface of the carapax is somewhat pitted as seen under a microscope, and the carpus and hand are decidedly pitted or erose, or a little uneven: in this last point it resembles the following species. The ten or eleven teeth of the antero-lateral margin are divided as follows: one corresponds to D, two to E, three to N, two or three to T, and two to S, the second of S being a posterior tooth, and sometimes having another smaller behind it. Of the three to N and T, the middle one is the largest. The penult segment of the male abdomen



is not at all oblong; and the same is true of the last segment, which is obtuse.

#### CHLORODIUS GRACILIS.

*C. sanguineo affinis.* Carapax non nitidus, anticè areolatus, posticè non areolatus, sulcis non profundis, areolis 2 R, 3 R non discretis, margine antero-laterali bene 5-dentato. Manus carpusque crassi, læves, nec rugati nec exesi. Pedes 8 postici compressi, inermes, pubescentes.

Near *C. sanguineus*. Carapax not shining, anteriorly areolate, posteriorly smooth, sulci not deep, areolets 2 R, 3 R not separated, antero-lateral margin neatly 5-toothed. Hand and carpus stout, smooth and even. Eight posterior feet compressed, unarmed, pubescent.

Plate 11, fig. 13 *a*, male, enlarged two diameters; *b*, extremity of male abdomen; *c*, female abdomen; *d*, tarsus of fourth pair; *e*, part of outer maxilliped.

Wakes Island, Pacific Ocean.

Length of carapax, five lines; greatest breadth, seven and one-fourth lines; ratio of length to breadth, 1:1.45.

Differs from the *sanguineus* in having but five marginal teeth, there being none posterior to S, and no inferior tooth between D and E, which characterizes that species; also, unlike the *exaratus*, the carpus and hand are not uneven in the upper surface, and the teeth are thin and even. In the male, the areolets are rather faint, and 4 L and 5 L are coalesced, and of about equal width; in a female, 4 L and 5 L are faintly separated, and the latter is the broader, as in the *sanguineus*.

#### CHLORODIUS NODOSUS (Randall), Dana.

Carapax anticè valde areolatus, areolis totis conspicuis, superficie minutè punctatis, 1 M, 2 M subcoalitis, 2 M non subdivisis; fronte paulo producto, emarginato, lobis margine concavis; margine antero-laterali crassiusculo, 6-7-dentato, dentibus D, d', E, N, T, S, s', D vix

*saliente, d' minimo, E, N, T, S, subconico, obtuso. Pedes antici inæqui, inermes manu carpoque minutè corrugatis aut areolatis, digito mobili non canaliculato, dente magno basali carente, apice obtuso, parce excavato. Pedes 8 postici fere nudi, tarso supra nudo, infra paulo hirsuto.*

Carapax anteriorly strong areolate, areolets all distinct, surface minutely punctate, 1 M and 2 M partly coalescent, 2 M not subdivided; front somewhat produced, emarginate, lobes with the margins concave; antero-lateral margin rather stout, 6-7-toothed, the teeth being D, *d'*, E, N, T, S, *s'*, D but slightly projecting, *d'* smallest, E, N, T, S, subconical, obtuse. Anterior feet unequal, unarmed, hand and carpus minutely corrugate or areolate, moveable finger not channeled, apex stout obtuse and but little excavated within, and having no large basal tooth. Eight posterior feet nearly naked, tarsus naked above, somewhat hirsute below.

Plate 11, fig. 14 *a*, male, natural size; *b*, front view of front, showing base of outer antennæ; *c*, outer maxilliped, enlarged two diameters; *d*, right hand, natural size; *e*, surface of carapax, enlarged; *f*, another portion of carapax; *g*, part of branch of first maxillipeds.

#### Sandwich Islands.

Length of carapax of a male, ten and a half lines; breadth, seventeen lines; ratio of length to breadth, 1 : 1.62. The species resembles closely the *C. sanguineus* in form, areolation, teeth, and the uneven surface of the hand and carpus. But the eight posterior legs are nearly naked, the anterior margin of the third joint quite so; the tarsus is naked on its upper margin; moreover, the surface of the carapax is fine punctate. The areolet 2 M has on the front of the outer half a V-shape depression. The tooth D is obsolete; the orbit has a small tooth-like prominence just below D, which is more prominent. The third joint of the outer maxillipeds has a small emargination on the anterior margin near the inner apical angle, and this margin is pubescent; the surface of this joint, moreover, is granulous and uneven.

The extremity of each finger is rather small and rounded, and there is but a slight spoon-shape excavation, the edge being thick,



and at first sight the species appeared to be a Xantho, yet the points shut on one another.

*Iagostoma nodosa*, J. W. RANDALL, J. Acad. Nat. Sci. Philad., viii. 111.

#### CHLORODIUS CAVIPES.

*Carapax non nitidus, latere rotundatus, superficie anticè areolatus, areolis partim granulosis et imbricato-granulosis; fronte fere recto, emarginato, margine antero-laterali crassiusculo, 8-9-dentato, dentibus D, d', E, E, N (vel N, N), T, S, s', totis parvulis, D vix saliente. Pedes antici inæqui, valde granulosi et corrugati, manu infra breviter villosâ et granulosa, digito mobili canaliculato, supra denticulato. Pedes 8 postici paulo asperati, articulo tertio breviter pubescente, 4to bene bicristato, cristis tenuibus cavitatem elongatam includentibus, 5to tarsoque omnino breviter hirsuto, tarso brevi.*

Carapax not shining, rounded either side, surface anteriorly areolate, areolets partly granulous and imbricato-granulous; front nearly straight, emarginate, antero-lateral margin somewhat stout, 8-9-toothed, teeth D, d', E, E, N (or N, N), T, S, s', all small, D scarcely salient. Anterior feet unequal, strongly granulous and corrugate, hand short villous and granulous below, moveable finger channeled and denticulate above. Eight posterior feet rather rough, third joint short pubescent, fourth prominently bicristate, the crests thin and including an oblong cavity between them, fifth joint and tarsus throughout short hirsute, tarsus short.

Plate 12, fig. 1 a, female, enlarged two diameters; b, abdomen of female.

Locality uncertain.

Length of carapax of female, seven lines; greatest breadth, ten and one-fourth lines; ratio, 1:1.46. The carapax is rather rough and uneven about the antero-lateral region towards the margin, and the other areolets have interrupted rugæ of granules, or scattered isolated granules. The most striking character is in the bicristate fourth joint

to the eight posterior legs, the thin crests enclosing a cavity; the crest along the proper dorsal margin of the joint is much the widest. The hands have an uneven surface, the upper side looking a little tuberculous, but the prominences run into rugæ below, and are all granulous. The front has a granulous margin. The teeth of the antero-lateral margin are small, and rather isolated. The outer maxillipeds, pterygostomian region, abdomen, and sternum, are short pubescent, and so the under surface of the third joint of all the pairs of legs.

The fingers of the smaller hand (left in specimen) are spoon-shape. Those of the larger are only imperfectly so, the two terminating in a stout edge nearly semicircular, which two shut upon one another.

3. *Carapax posticè non areolatus, anticè vix areolatus, fere planus aut paulo convexus, 5 L, 6 L nunquam circumscriptis.*

#### CHLORODIUS CYTHEREA.

*C. nigro affinis.* Carapax fere lævis, areolis mediis indistinctis, antero-lateralibus melioribus, angulatis, margine antero-laterali 5-dentato, dentibus N, T subacutis, E, S minoribus, T valde prominentiore quam S, ideoque carapacis latitudine T majore quam latitudo S. Pedes antici iis C. nigri similes, digitis nigris, fere contiguus. Pedes 8 postici inermes, margine pubescentes.

Near *C. niger*. Carapax nearly smooth, medial areolets indistinct, antero-lateral distinct and rather prominent and angular, antero-lateral margin five-toothed, teeth N, T subacute or acute, E and S smaller than the others, and S much less prominent than T (hence carapax much broader across from T to T than from S to S). Anterior feet as in *C. niger*, fingers black, nearly contiguous. Posterior eight feet unarmed, margin pubescent.

Plate 12, fig. 2 *a*, female, three diameters; *b*, extremity of male abdomen; *c*, part of outer maxilliped.

Island of Raraka, Paumotu Archipelago; also Tahiti and Sandwich Islands.

Length of carapax, three and one-third lines; greatest breadth, five



and one-third lines; ratio of length to breadth, is 1 : 1.6. Differs from *C. niger* in having the tooth S much less prominent than tooth T; also E is distinct, so that there are distinctly five teeth in all; moreover the areolets 1 L, 3 L, 4 L are more angular, instead of being smooth and continuous with the lateral teeth, and the teeth N, T are nearly or quite acute.

#### CHLORODIUS NEBULOSUS.

*C. nigro affinis.* Carapax laevis, anticè obsoletè areolatus, fronte parce emarginato, regione antero-laterali rugato et subtilissimè granulato, margine antero-laterali 4-dentato (D, N, T, S), dentibus tribus posticis acutè spiniformibus. Pedes antichi subaequi, sat breves, brachio paululo saliente, carpo subtiliter granulato, intus acuto aut subacuto, manu compressâ, laevi, digitis paulo canaliculatis. Pedes postici mediocres, paulo pubescentes.

Near *C. niger*. Carapax smooth, obsoletely areolate anteriorly or not at all, front sparingly emarginate, antero-lateral region rugate, very fine granulous, antero-lateral margin four-toothed (D, N, T, S), three posterior teeth like acute spines. Anterior feet subequal, rather short, the arm projecting but very little beyond the carapax, carpus granulate, acute at inner angle or subacute, hand compressed, smooth, fingers somewhat channeled. Posterior feet of moderate size, a little pubescent.

Plate 12, fig. 3, part of animal, much enlarged.

Sooloo Sea.

Length of carapax of male, 2.2 lines; greatest breadth, 3 lines; ratio of length to breadth, 1 : 1.36. Colour clouded with reddish brown or brownish black. The short arm of this species distinguishes it from the *cytherea*, which it most resembles; moreover the carpus is granulate as seen under a lens. The teeth of the lateral margin are quite sharp, the orbital is very short, and there is a trace of E, in a slight ruga; S is smaller than T, yet acute. The areolation is not quite as distinct as shown in the figure of the *C. cytherea*. On the

front margin of the arm there is an acute spine, and the carpus is acute on the inner side on the right arm, and subacute on the left arm. The extremity of the tarsus is like that of the *lævissimus*.

An imperfect specimen from the Feejees or Tongatabu, has the lateral teeth of this species, and may be identical with it: see figure 3*b*, plate 12, which represents the antero-lateral margin. The carpus is prominent acute at its inner angle, and there is a prominence on the anterior margin of the arm.

#### CHLORODIUS LÆVISSIMUS.

*C. nigro affinis.* Carapax *perlævis, nec ad medium nec versus latera areolatus, margine antero-laterali 4-5-dentato, dentibus N et T paulo remotis, E sæpe obsoleto, S minore, T et S obtusis, carapacis latitudine T majore quam latitudo S. Pedes antici longi, pervalidi, læves, digitis multo hiantibus. Pedes 8 postici paulo pubescentes.*

Near *C. niger*. Carapax very smooth, not areolate either at middle or towards the sides; antero-lateral margin four to five-toothed, tooth E often obsolete, S smaller than T, T and S obtuse, breadth of carapax across from T to T greater than from S to S. Anterior feet long and very stout, smooth, fingers much gaping. Posterior eight feet somewhat pubescent.

Plate 12, fig. 4 *a*, male, enlarged three diameters; *b*, extremity of male abdomen, enlarged; *c*, female abdomen, enlarged; *d*, right hand, enlarged three diameters; *e*, left, *ibid.*; *f*, part of outer maxilliped; *g*, extremity of tarsus, much enlarged.

Sandwich Islands.—Probably the same from Tutuila, of the Samoan Group, and from the Straits of Balabac.

The absence of all areolation, even near the lateral teeth, distinguishes this species from the *niger* or *cytherea*. Some young specimens of the preceding species appear to approach the *lævissimus*. But the hands afford another distinctive character, they being very stout, and the fingers less slender and more gaping than in the *niger*. The specimens are of a pale colour, not even the fingers having a dark



shade; while in the specimens of the other species that approach this, the fingers are black or dark brown. The two posterior teeth of the margin (T and S) are very much nearer one another than N and T, and they are small conical teeth, somewhat obtuse, differing much in appearance from those of the *niger*. The fingers of the smaller hand in the male leave a wide space between them when closed, and each has two very small teeth or salient angles on the margin; the right hand has three small teeth on the moveable finger, rather distant from one another, and on the immoveable finger, three or four teeth towards base, and one half way from these to the apex.

The *Menippe Martensii* of Krauss resembles this species in the outline of the carapax, but not in its long arm and in other characters.

#### CHLORODIUS NIGER.

Feejee Islands; Tongatabu; Wakes Island; Upolu; Sooloo Sea, and Mangsi Islands.

Plate 12, fig. 5 *a*, antero-lateral portion of carapax, enlarged two diameters; *b*, larger hand, enlarged two diameters; *c*, front view of front.

The carapax is not narrower across from S to S than from T to T, the teeth T and S being about equally prominent, and T, S not nearer than N, T. All the teeth in adults are obtuse. It is owing to E being obsolete that the number of the teeth is only four; there is usually a slight trace of E in a swelling of the surface. The areolets adjoining the margin are smoothly rounded, and the surface in that part, hence appears as if made up of a few wrinkles. The rest of the surface is smooth, with faint traces of the medial areolets.

*Cancer niger*, FORSKAL.

*Chlorodius niger*, RUPPELL, Krabben des rothen Meeres, p. 20, pl. 4, f. 7; EDWARDS, Crust., i. 401.

*Chlorodius hirtipes*, var. (?) ADAMS and WHITE, Crust. Samarang, p. 40, pl. 11, f. 4.

#### GENUS PILODIUS, Dana.

*Pilumno aspectu similis*; *pedibus antennisque Chlorodio affinis*. *Arti-*

*culus antennarum externarum primus eo Chlorodii brevior, ad processum oblongum frontalem attingens tantum. Articulus maxillipedis externi 3tius paulo transversus, subrectangulatus.*

Resembling *Pilumnus* in general form, and near *Chlorodius* in feet and antennæ. First joint of outer antennæ shorter than in *Chlorodius*, and just reaching to an oblong process of the front. Third joint of the outer maxillipeds somewhat transverse, subrectangular.

Although the species have the spoon-shaped fingers of *Chlorodius*, in form they are usually narrower, much like *Pilumnus*, and one species of *Chlorodius* here included has been named *C. pilumnoides*, by Adams and White, in allusion to this resemblance. In *Pilodius*, the process that reaches from the front or its under surface to the first joint of the outer antennæ, passing just inside of these antennæ, is oblong and narrow, while in *Chlorodius* it is broader than long; moreover, in the former, the joint, although soldered to the front, does not reach so high up in the orbital fissure; moreover, in *Pilodius* this process seems but a bending down of the outer edge of the front itself, while in *Chlorodius* the process is usually from the under surface of the front. This is the same distinction that exists between *Xantho* and *Xanthodes*. The body is usually thicker at the sides than in *Chlorodius*, and the latero-posterior margin is somewhat less oblique.

#### PILODIUS PUBESCENS.

*C. pilumnoidi similis. Carapax breviter pubescens, anticè leviter areolatus, margine antero-laterali simplicissimè 5-dentato, dentibus tenuibus, acutis. Pedes antici validi, minutè tuberculosi et pubescentes, digitis subspinulosis, brachio anticè dentigero. Pedes 8 postici pilosi, articulo tertio supra spinuloso.*

Near *C. pilumnoides*. Carapax short pubescent, faint areolate anteriorly, antero-lateral margin simply five-toothed, teeth slender acute. Anterior feet stout, small tuberculous and pubescent, fingers subspinulous, arm with two or three prominent teeth on the anterior margin. Posterior eight feet pilose, third joint spinulous above.



Plate 12, fig. 6 *a*, male, enlarged three diameters; *b*, extremity of abdomen, enlarged; *c*, front view of front, showing process *p*, &c.; *d*, outline of back.

Sooloo Sea, or Balabac Passage.

Length of carapax, three and two-thirds lines; greatest breadth, five and one-half lines; ratio of length to breadth, 1 : 1.5. The hairs of the surface and legs are much finer than in the *pilumnoides*, and have a brown colour. The anterior legs are very similar to those of that species; but the areolation of the carapax is much less distinct, and the antero-lateral teeth are simple and slender.

#### PILODIUS NITIDUS.

*Carapax bene nitidus, anticè optimè areolatus, areolis plerumque planis, 1 R, 2 R sulco discretis, 1 R 2-3 tuberculis anticè ornatâ; margine antero-laterali bene 5-dentato, dentibus duobus posticis acutis. Pedes antici spinis valde armati, digito mobili prope basin interdum spinuloso, carpo intus duobus spinis tenuibus acutis armato. Pedes 8 postici pubescentes, articulo tertio supra armato.*

Carapax shining, anteriorly very distinctly areolate, areolets very neat, and mostly with a flat surface, 1 R, 2 R separated by a furrow, 1 R having two or three tubercles on its anterior margin; antero-lateral margin five-toothed, the two posterior acute. Anterior feet strongly armed with spines, moveable finger sometimes spinulous near base, carpus having two slender spines on inner angle. Posterior eight feet pubescent, third joint armed along upper margin.

Plate 12, fig. 7 *a*, male, enlarged three diameters; *b*, right arm, enlarged four diameters; *c*, extremity of abdomen; *d*, leg of third or fourth pair, enlarged three diameters; *e*, front view of front.

Reef of Tutuila, Samoan Group.

Length of carapax, three and one-third lines; greatest breadth, five lines; ratio of length to breadth, 1 : 1.5. The polished surface of this

species is a striking character; also the deep, narrow furrow between the areolets, which are all flat excepting the three near the margin. Upon the posterior part of the carapax the areolets 1P and 2P are imperfectly separated. The right anterior leg, which is the smallest of the pair in the specimen examined, has the carpus and hand both spinous, and the moveable finger spinulous near base; while the left or large hand has the moveable finger not spinulous and the spines of the carpus are reduced to short tubercles. The fourth and fifth joints of the eight posterior legs are somewhat spinulous above, and so also the tarsus.

PILODIUS PUGIL.

*Carapax paulo nitidus anticè areolatus, posticè fere planus, areolis 5 L 6 L discretis, 1 L 2 L 3 L subconicis, 1 R 2 R paulo discretis; margine antero-laterali 4-dentato, dente E fere obsoleto, dentibus tribus posticis valde acutis. Pedes antici validi, manu carpoque bene tuberculosus tuberculis plerumque conicis, manus minoris spiniformibus, angulo carpi interno duobus spinis tenuibus acutis armato, brachio apicem anticum spinoso. Pedes postici pilosi, articulo tertio supra armato.*

Carapax somewhat shining, anteriorly faint areolate, posteriorly nearly flat, areolets 5 L, 6 L faintly separated, 2 L, 3 L, 4 L distinct, 1 R, 2 R separated; antero-lateral margin four-toothed, the tooth E being obsolete or nearly so, the three posterior prominent and acute. Anterior feet stout, hand and carpus neatly tuberculous, tubercles mostly conical, inner angle of carpus armed with two slender acute spines, arm having a spine at anterior apex. Posterior leg pilose, third joint armed with spinules along upper margin.

Plate 12, fig. 8 *a*, male, enlarged four diameters; *b*, extremity of male abdomen, enlarged; *c*, front view of front, showing process *p*; *d*, fingers of same male, enlarged; *e*, abdomen of a female, from Bala-bac Passage, enlarged; *f*, fingers of larger hand, *ibid.*; *g*, front view of front, *ibid.*; *h*, enlarged view of one of the hairs of the posterior legs; *i*, part of outer maxilliped.



Reefs of Upolu, Samoan Group, Pacific; also Balabac Passage, north of Borneo.

Length of carapax of a male, two and a half lines; greatest breadth, four lines; ratio of length to breadth, 1:1.6. The obsolescence of tooth E reduces the number to four, of which the posterior three are equally prominent. The tubercles of the larger hand are either neatly rounded or subacute and conical; those of the carpus are partly lengthened into cones, or are verging towards spiniform tubercles. The prominence at the apex of the arm which covers the articulating process of the following joint bears one or two spines, which is not true of the *nitidus*. The hairs or setæ of the posterior legs are naked at base, but through all their length except the lower fourth, it is enlarged and is densely setulose, as shown in figure *f*. The female has a few setæ like those of the posterior legs on the carapax, one or two being situated at a point in the anterior margin of several of the areolets, as 1 M, 2 M, 4 L, 5 L in two points, 4 M also, at a point either side of 3 M. The third, fourth, fifth, and last joints of the posterior legs are spinulose. Surface of carapax under a microscope, granulous, and anterior edges of frontal areolets fine crenulate, owing to granulations.

#### PILODIUS SCABRICULUS.

*Carapax fronte latus, anticè leviter areolatus, paulo scabriculus, areolis 1 L, 3 L, 4 L subacutis et scabriculis, margine antero-laterali fere longitudinali, 4-dentato (dente E fere obsoleto), dentibus tribus (N T S) acutis, spiniformibus. Pedes antici fere æqui, manu carpoque subtilissimè tuberculatis, tuberculis partim seriatis, digitis canaliculatis, paulo scabriculis, articulo tertio anticè denticulato. Pedes postici sparsim pubescentes, articulo tertio supra minutè spinuloso, tarso longo.*

Carapax with a broad front, anteriorly faint areolate, a little scabrous, areolets 1 L, 3 L, 4 L subacute and minute scabrous, antero-lateral margin nearly longitudinal, four-toothed, tooth E nearly obsolete, teeth three (N, T, S) acute, spiniform. Anterior feet nearly equal, hand and carpus very minutely tuberculate and in part seriatly so, fingers channeled, minute scabrous, third joint anteriorly den-

ticulate. Posterior feet sparsely pubescent, third joint above minutely spinulose, tarsus long.

Plate 12, fig. 9, animal, enlarged four diameters.

From Balabac Passage; also a similar species from Raraka Island, Paumotu Archipelago.

The specimen from Balabac Passage is quite small, the length of the carapax being 1.7 lines, and the greatest breadth, 2.6 lines; ratio of length to breadth, 1 : 1.53. The Raraka specimen (a female), is two and two-thirds lines long, and four broad; ratio, 1 : 1.5. The carapax anteriorly is minutely rough under the microscope, especially near the antero-lateral teeth; and in this part the areolets are somewhat prominent and pointed or scabrous. In the Raraka specimen, one or two of the antero-lateral teeth have a spine on the outer side, and the obsolescent tooth E is a minute spinule. The minute points or tubercles of the hand extend half way down its inner surface. The fingers are black or nearly so.

This species resembles the *P. pugil*, but the front is much less projecting, the outline being more nearly straight, and the tubercles of the hand are far smaller and more numerous; moreover, the areolation is not as bold.

PILODIUS PILUMNOIDES? (*White*) Dana.

*Carapax anticè leviter areolatus, et breviter hirsutus, margine antero-laterali brevi, 4-5 acervato-spinuloso, spinulis fere æquis vix conspicuis, superficie subtiliter hirsutâ. Pedes antici scabriculi et partim subtiliter hirsuti, granulis manus externis vix seriatis, superficie manus inferiore glabrâ, digitis canaliculatis, superiore supra spinuloso. Pedes 8 postici hirsuti lateribus articuli 3tii exceptis, margine superno spinuloso.*

Carapax faint areolate anteriorly and short hirsute, antero-lateral margin short, with four to five clusters of nearly equal spinules, which are hardly seen without removing the hirsute covering. Anterior feet scabrous and in part minute hirsute, granules of outer



surface of hand scarcely seriate, under surface of hand glabrous, fingers channeled, the upper spinulous above. Eight posterior feet hirsute, excepting sides of third joint, upper margin of third joint spinulous.

Plate 12, fig. 10 *a*, outline of antero-lateral margin; *b*, front view of front and base of outer antennæ; *c*, outline of back.

From the Sooloo Sea, or Balabac Passage.

In the *pilumnoides*, as described and figured by White, the antero-lateral margin has distinct teeth, and although consisting of spinules in part, there is a prominent or dominant spine. In our specimens, the five normal teeth may be distinguished, though much subdivided into smaller teeth, and irregularly so; D consists of two teeth; E of two; N of four; T of three, with two or three on the surface above; S of one, with one or two on the upper surface. D and E are so close together that they appear at first to make a single group. The minute tubercles of the anterior part of the carapax are somewhat acute, or like short spinules on the areolets near the antero-lateral margin. The surface of the carapax is hairy, but nearly naked posteriorly, and the legs are rather long hairy; the hairs are like bristles, and many of them black in their lower half, but become light-coloured in their upper half. The anterior margin of the arm has about three small teeth on its lower half, and is hardly denticulate above, instead of having prominent teeth, towards apex, as in the figure by Adams and White.

*Chlorodius pilumnoides*, ADAMS and WHITE, Crust. Voy. Samarang, 41, pl. 9, f. 3.

#### GENUS CYCLODIUS.

*Chlorodio affinis*, carapace angustiore, suborbiculato, articulo maxillipedum externorum tertio triangulato, paulo transverso, latere interiore brevissimo.

Near *Chlorodius*. Carapax narrower, suborbicular; third joint of outer maxillipeds triangular, a little transverse, the inner side below fourth joint very short.

The body in the species of this genus, appears very nearly circular, as the base of the abdomen projecting behind the carapax, in the natural state of the parts, added to the length of the carapax, very nearly equals the breadth of the carapax. The areolation of the carapax, in the species seen, is very similar to that of *C. ungulatus* and *C. monticulosus*, both for the anterior and posterior parts of the surface. The process of the front adjoining the outer antennæ is short and broad, as in *Chlorodius*, rather than like the same in *Pilodius*. The third joint of the outer maxillipeds is shorter than long, and the terminal side is the longest of the triangle; this side is notched for the insertion of the fourth joint, and also exterior to this joint, very much as in *Chlorodius*.

## CYCLODIUS ORNATUS.

*Carapax nudus, parce nitidus, anticè posticèque valde areolatus, areolis sæpe compositis, 2 M subdivisâ, 3 M tripartitâ; margine antero-laterali 5-dentato, dentibus tumidis, apiculatis, dente E minore, rotundato, D obtuso. Pedes spinulis armati, 8 posticis parce pubescentibus, manu seriatim spinulosâ, digitis spinulosis.*

Carapax naked, somewhat shining, anteriorly and posteriorly areolate, areolets often compound, 2 M subdivided, 3 M tripartite; antero-lateral margin five-toothed, teeth tumid, apiculate, tooth E smaller than the others, D obtuse. Legs all armed with spines, posterior eight sparingly pubescent, hand seriatly spinulous, fingers spinulous.

Plate 12, fig. 11 *a*, animal, enlarged three diameters; *b*, profile of front part of carapax; *c*, under view of anterior part of body; *d*, front view of front, showing process *p* in this view; *e*, view of lateral portion of ventral carapax, showing the areolation; *f*, abdomen, enlarged; *g*, hand.

Sooloo Sea, or Balabac Passage, north of Borneo.

Length of carapax, three and a half lines; greatest breadth, four and one-third lines; ratio of length to breadth, 1 : 1.25. The areolets



are very prominent, and broken much as in *Chlorodius monticulosus*. The abdomen has the last segment triangular, and a little oblong; the third joint abruptly broader than either the second or fourth, and on either side triangular.

#### CYCLODIUS GRACILIS.

*C. ornato aspectu areolisque similis, parce latior, dentibus antero-lateralibus tribus posticis tenuioribus et bene acutis, areolis vix compositis, 2M subdivisâ, 3M vix tripartitâ. Pedes armati, 8 posticis paulo pubescentibus, manu seriatim spinulosâ, digitis spinulosis.*

Near *ornatus* in appearance and areolation, but sparingly broader, three posterior antero-lateral teeth more slender and neatly acute, areolets hardly compound, 2M subdivided, 3M scarcely tripartite. Feet armed, eight posterior a little pubescent, hand seriately spinulous, fingers spinulous.

Plate 12, fig. 12 *a*, animal, enlarged three diameters; *b*, leg of posterior pair, enlarged.

From Tutuila, Samoan Group, Pacific.

Length of carapax, three lines; greatest breadth, four lines; ratio of length to breadth, 1 : 1.33.

The abdomen and hands in this species, are the same very nearly as in the *ornatus* (see figures *f* and *g* of that species). The posterior legs are also similar; yet the spinules appear to be a little more prominent. It is possible that this may be only a variety of the *ornatus*.

#### GENUS CYMO, *De Haan*.

The species of *Cymo* have a very peculiar aspect, the body being flattened, and approaching orbicular in outline, and the larger hand rather long, with very stout fingers, the upper much curved. The front margin is equal to half the whole breadth of the carapax, and there is no point of separation between the antero-lateral and postero-

lateral margins. The species are small, the largest seen being about half an inch in length.

CYMO MELANODACTYLUS, *De Haan.*

*Carapax vix areolatus, partim subtilissimè pubescens, lateribus convexis, sive non dentatis sive obsolete 2-3-dentatis, fronte denticulato, dentibus acutis fere æquis. Pedes antici multo granulati, digitis nigris, valde scabris. Pedes 8 postici hirsuti.*

Carapax hardly at all areolated, in part having an exceedingly short pubescence, sides convex, either not dentate or with two or three obsolescent dentations, front rather evenly denticulate, the teeth acute. Anterior feet much granulous, fingers black, scabrous. Posterior eight feet hirsute.

Plate 13, fig. 1, male, enlarged three diameters.

Feejee Islands.

Length and breadth of carapax of a male, each five lines. The teeth of the front margin are six in number, with an intermediate smaller one in one or two of the intervals. On the lateral margin towards the middle there are two obsolescent teeth. The granules of the hand are very closely set, and in two lines are somewhat seriate and more raised. The hand is rounded above; one of the specimens is a female, with eggs beneath the abdomen. The smaller hand has rather slender fingers, and they are in contact. The male abdomen appears to be five-jointed.

*Cymo melanodactylus*, DE HAAN, Faun. Japon., 22.

CYMO ANDREOSSYI (*Savigny*) *De Haan.*

*Digitus manus majoris mobilis albus, lævis, juxta basin paulo scaber, crassus. Frons irregulariter denticulatus.*



Moveable finger of larger hand white, smooth, a little scabrous near base, stout. Front irregularly denticulate.

Plate 13, fig. 2 *a*, male, enlarged three diameters; *b*, under view of front, showing base of outer antennæ.

Upolu, Samoan Group; also Tahiti, Society Group.

Length and breadth of carapax of a male, each six lines. The resemblance to the preceding species is very close, although the two are separated easily by the characters stated. The anterior part of the lateral margin is rather shorter than the posterior. The granules of the hand in the dried specimen are partly white and partly reddish, the red ones scattered among the others.

*Pilumnus Andreossyi*, SAVIGNY, Desc. de l'Égypte, Crust., p. 86, pl. 5, f. 5.

*Cymo Andreossyi*, DE HAAN, Faun. Japon., 22.

#### SUBFAMILY POLYDECTINÆ.

#### GENUS POLYDECTUS, *Edwards*.

The species here referred to *Polydectus* has many characters in common with the *P. cupulifer*, and the two, evidently, are congeneric. Besides general form and aspect, one of the most striking characteristics is the peculiarity of the hand, which is hardly stouter than the following legs, and although short, consists of long, slender fingers, the palm at the base of the fingers being very short. Moreover, these fingers are nearly equal, and have the apices incurved. Another character in common is observed in the orbit, there being three tubercles or lobes forming the under and outer part of the orbital margin; in the *cupulifer* these prominences are hollowed out,—a specific and not a proper generic distinction.

The genus *Polydectus* was transferred to the *Corystidæ* by Milne Edwards, from the genus *Pilumnus*, where it was placed originally by Latreille. The character of the outer antennæ, especially the slender, nearly naked flagellum, removes it from the *Corystidæ*; and it is not related particularly to that family in the form of the outer maxillipeds. The second joint of these organs is somewhat transverse in our

species, and but little oblong in the *cupulifer*; moreover they neatly close up the buccal area. It appears to be most closely like the Cancroidea, and may come near *Pilumnus*, or near *Halimede*. Still it differs widely from *Halimede*, as already explained.

The specimen from which our figure and description were taken, was lost, with others of the same region, in the wreck of the Peacock; and we cannot, therefore, resolve our doubts with regard to the character of the palate, which would definitely fix its true place. It is probable that the genus should form a subfamily distinct from any other described Cancroidea, and so we have made it; but its place with the Cancridæ rather than the Eriphidæ is hypothetical.

POLYDECTUS VILLOSUS.

*Carapax pedesque densissimè villosi, pilis plumiformibus, fronte margineque antero-laterali integris. Digitus mobilis parvis antici duabus spinis elongatis remotis et alter spinis tribus armatus. Antennæ externæ fronte vix longiores, flagello 10-articulato.*

Carapax and feet with a dense villous coat, the hairs of which are plumiform; front and antero-lateral margin entire. Moveable finger with two remote slender spines within, and the thumb with three spines. Outer antennæ as long as the front, flagellum 10-jointed.

Plate 13, fig. 3 *a*, female, enlarged; *b*, under view; *c*, hand; *d*, abdomen of female; *e*, one of the plumose hairs of the villous coat.

Found under stones along the shallow shores of Raraka Island, Paumotu Group.

Length, four lines. Colour, pale ashy yellow. The hands in the specimen procured were overgrown with a kind of sponge, which had grown around and enclosed the fingers, as shown in the figure of the hand on the right. The form in the figure is not exactly the form of the carapax, but that due to the position of the villous covering. The flagellum of the outer antennæ has two or three short hairs at the apex of each of its joints. The last two joints of the base are much smaller than the first. Third and fourth pairs of legs the longest. Legs of the first pair equal. The fingers are like long, slender claws



incurved at apex, and when shut the tips alone close together. The spines of the inner margin nearest the apex are the smaller. On the outer side, towards the extremity, the fingers bear recurved hairs. The female abdomen is very broad oval, and consists of seven segments. The inter-orbital space is scarcely one-third the breadth of the carapax. The inner antennæ occupy transverse fossettes situated mostly anterior to a line between the orbits.

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### FAMILY III. ERIPHIDÆ.

THE ridge upon the prælabial area or palate is prominent in *Eriphia* and *Ruppellia*, and a deep rounded emargination in the margin of the buccal area marks the termination of the efferent canal. A similar emargination, less distinct, exists in some other genera, as *Trapezia* and *Ozius*. Traces of this ridge are seen in some of the *Cancridæ*, as in certain *Actææ*, *Paraxanthi*, *Pseudocarcini*, &c.; but in these species, it is quite small, and stops far short of the anterior margin of the buccal area. In *Pilumnoides* it is very distinct and prominent, and it is also apparent in the *Pilumni*, although these species have in many respects the habit and form of some *Xanthodes*, in which the ridge is wanting or is obsolescent. In a few *Pilumni* it stops a little short of the anterior margin; but it is continued anterior to the first episternal suture which crosses the surface, which suture is indicated by a notch in the ridge, and is shown in our figure of the prælabial area of *Pseudozius planus*, pl. 13, fig. 6; the ridge has often a slight interruption at this point.

This family may be divided into subfamilies, on the same grounds nearly as the *Cancridæ*. The subfamily *Cancrinæ* is represented in this group by *Æthrinæ*, and a general parallelism is easily made out between the other subfamilies. These subdivisions and the genera included, with their characteristics, are presented in the following table:—

1. **ÆTHRINÆ**.—Carapax transversus, lateribus valde dilatatus et rotundatus. Antennæ internæ fere longitudinales.

G. 1. **ÆTHRA**, *Leach*.

2. OZINÆ.—Carapax plus minusve transversus, lateribus non dilatatus. Digi acuminati. Antennæ internæ transversæ. Orbita hiatu interno basi antennæ occupato instructa. Abdomen *maris* 7-articulatum.

1. *Articulus antennæ externæ 1mus frontem bene attingens.*

G. 1. GALENE, *De Haan*. \*—Carapax transversus, longitudinaliter multo convexus, antice declivis.

G. 2. OZIUS, *Leach*.—Carapax transversus, latus, fere planus.

2. *Articulus antennæ externæ 1mus frontem non attingens.*

G. 3. PSEUDOZIUS, *Dana*. †—Carapax transversus, fere planus, latior, margine antero-laterali brevior quam postero-lateralis.

G. 4. PILUMNUS, *Leach*.—Carapax angustus, parce transversus, sæpius convexus, margine antero-laterali brevior.

G. 5. PILUMNOIDES, *Edw. et Lucas*. ‡—Carapax angustus, parce transversus, valde convexus, margine antero-laterali longior, bene arcuato, super carapacem postice incurvato.

G. 6. MELIA, *Latr*.—Carapax subquadratus, fere planus, fronte lato, oculis versus angulos insitis. Pedes toti graciles. Basis antennæ externæ cylindrica.

An genus sequens hîc pertinet?

ACANTHODES, *De Haan*. §—Carapax angustus, *Pilumno* formâ affinis, spinis grandibus anticè armatus. Pedes spinosi.—Species *Acanthodes armatus* Haanii magnitudine portentosus.

3. ACTUMNINÆ.—Orbitâ *Ozinis* similis. Digi instar cochlearis excavati.

G. ACTUMNUS, *Dana*. ||—Carapax paulo transversus, valde convexus, antice lateraliterque curvatim declivis. Articulus antennæ externæ 1mus processum frontis attingens tantum.

4. ERIPHINÆ.—Orbita infra bene clausa, hiatu interno carens, articulo antennæ basali e orbitâ omnino excluso. Carapax sive paulo transversus sive subquadratus.

\* Faun. Japon., 19.

† Near *Pseudocarcinus*, from which it differs in the ridge on the prælabial plate, as well as in its flatter form.

‡ Crust. D'Orb. S. Am., 21.

§ Faun. Japon., 20.

|| Very near *Actæa*, but the prælabial plate or palate is strongly divided by a ridge either side. Besides, the form is much narrower and more convex than in the *Actæa*, being subglobose above.



- G. 1. RUPPELLIA, *Edw.*—Carapax latior. Antennæ pars mobilis externæ orbitâ paululum remota. Articulus maxillipedis externi 3tius paulo transversus.
- G. 2. ERIPHIA, *Latr.*—Carapax angustus, convexus, fronte sæpius valde declivi. Antennæ pars mobilis externæ orbitâ longe remota. Articulus maxillipedis externi 3tius paulo transversus.
- G. 3. DOMÆCIUS, *Eydoux et Souleyet*. \*—*Ruppellia* formâ antennisque externis affinis. Carapax depressus, angustus. Articulus maxillipedis externi 3tius valde transversus, brevissimus.
- G. 4. TRAPEZIA, *Latr.*—Carapax subquadratus, planus, glaber, fronte horizontalis, leviter 6–8-dentatus aut sinuosus, lateribus longitudinalis. Tarsi non unguiculati, minutè spinulosi. Brachium ultra carapacem longe exsertum.
- G. 5. TETRALIA, *Dana*. †—Carapax aspectu *Trapezia* affinis. Frons horizontalis, rectiusculus, subtilissimè denticulatus. Tarsi breviter unguiculati. Brachium ultra carapacem paulo exsertum.
- G. 6. QUADRELLA, *Dana*.—Carapax subquadratus, paulo convexus, lævis, fronte horizontalis, 6-spinoso-dentatus. Tarsi unguiculati. Brachium ultra carapacem longe exsertum.

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SUBFAMILY I. OZINÆ.

GENUS OZIUS.

OZIUS TRUNCATUS, *Edwards*.

Plate 13, fig. 4 *a*, female, natural size, from Bay of Islands, New Zealand; *b*, abdomen of same, natural size; *c*, moveable finger of larger hand.

Bay of Islands, New Zealand, and Illawarra, New South Wales.

Length of carapax from Illawarra, one and seven-eighths inches; greatest breadth, two and seven-eighths inches; ratio of length to breadth, 1 : 1.53. Of female, from New Zealand, length, one and one-sixth inches; breadth, one and three-fourths inches; ratio, 1 : 1.5. Carapax nearly plane above, but not glabrous, granulous anteriorly. The arcolet 2 F is prominent; 1 M and 2 M are united; 2 M and 3 M

\* Voy. of the Bonite, Crust., pl. 2, f. 5; also, "Voy. au Pole Sud," under D'Urville, in the Astrolabe and Zélée, plate 6, figs. 3–7, by Hombron and Jacquinot.

† Amer. Journal Sci. [2], xi. 223.

are prominent anteriorly, but posteriorly become obsolete. 5 L, 6 L are also obsolete, and 2 L, 3 L, 4 L are united into a broad surface, the anterior margin of which runs obliquely inward and a little forward from the penult tooth, 4 L being partly separate. A prominent line starting from the last tooth (S), extends inward anterior to 5 L. In one specimen the outline of 1 P is perceptible; it is about as long as broad. The last three teeth of the lateral margin are the normal teeth, N, T, S. The only other is the orbital D, E being wanting; the surface in this part is somewhat rugose. The eight posterior legs are minutely rugose or granulous and hirsute; the tarsus is densely hirsute on all sides.

Colour of carapax, dark brown to brownish red, and rusty or grayish yellow anteriorly. Large hand, dark reddish brown, a little red on the inner side; fingers, brownish black.

*Ozius truncatus*, EDWARDS, Crustacés, i. 406, pl. 16, f. 11.

*Xantho deplanatus*, A. WHITE, Jukes's Voy., H. M. S. Fly, p. 337.

#### GENUS GALENE, *De Haan*.

The species of this genus below described, has a broad Eriphioid form, the greatest breadth being anterior to the middle. The characters are those of *Ozius*, as regards the outer antennæ, the prælabial ridge, and the emargination of the prælabial margin at the exit of the efferent canal. But the carapax, instead of being nearly flat above, is very convex longitudinally, the anterior portion curving very much downward. The third joint of the outer maxillipeds is articulated with the fourth by its inner apical angle, as in other Cancroidea; margin of the front very thin; epistome rather broad; inner antennæ very slender and quite transverse. Antero-lateral margin terminates anteriorly in the outer angle of the orbit. Male verges Cancroid as to their insertion, and not Grapsoid.

The texture of the carapax is less calcareous than in other Cancridæ, being like that of the Telphusidæ, to which family the species may be allied.

*Galene*, DE HAAN, Faun. Japon., p. 19; KRAUSS, Südafrik. Crust., p. 31.



## GALENE HAWAIIENSIS.

*Carapax valde transversus, lævis, paulo nitidus, fronte paululum sinuoso, margine antero-laterali 4-dentato, dentibus 2 anticis obtusis, anteriore marginem paulo excavato. Pedes antici valde inæqui, læves, breves, supra rotundati, digito mobili leviter dentato, dente basali tuberculiformi, carpo intus unidentato. Pedes 8 postici sat graciles, articulo tertio supra paulo pubescente, sequentibus pubescentibus.*

Carapax much transverse, smooth, a little shining, front a little sinuous; antero-lateral margin four-toothed, two anterior teeth obtuse, the first slightly excavate. Anterior feet very unequal, smooth, short, rounded above, moveable finger slightly dentate, also having a tuberculiform basal tooth; carpus having a tooth on inner side. Eight posterior feet rather slender, third joint somewhat pubescent above, the following pubescent.

Plate 13, fig. 5 *a*, outline of part of carapax, enlarged; *b*, buccal area.

Sandwich Islands.—C. Pickering.

Length of carapax,  $7\frac{1}{2}$  lines; breadth,  $10\frac{1}{2}$  lines; ratio of length to breadth, 1 : 1.5. This species is exceedingly near the *G. natalensis* of Krauss, from Southern Africa. It has, however, the first of the antero-lateral teeth, with a concave margin instead of convex, and the third joint of the eight posterior legs is not wholly naked, as in the *natalensis*. It is still possible that it is only a variety of that species.

## PSEUDOZIUS, Dana.

*Carapax plus minusve transversus, margine antero-laterali brevior quam postero-lateralis. Articulus antennarum externarum 1mus angustus et brevis, frontem non attingens (eoque Pseudocarcino affinis). Area prælabialis lineâ elevatâ bene subdivisa (eoque Ozio affinis). Digiti acuminati.*

Carapax transverse, the antero-lateral margin shorter than the postero-lateral. First joint of outer antennæ not reaching to the front, as in *Pseudocarcinus*. Prælabial area divided throughout by a ridge, as in *Ozius*. Fingers pointed.

The species have the outer antennæ of *Pseudocarcinus*, and the prælabial area of *Ozius*. The following, here described, have a depressed or nearly flat back, and smooth surface.

PSEUDOZIUS PLANUS.

*Carapax latus, lævis, fere planus, non areolatus, anticè prope marginem leviter impressus; fronte fere recto, paulo emarginato; margine antero-laterali paulo acuto, fere integro, levissimè 4-lobato, margine postero-laterali recto. Pedes antici paulo inæqui, læves et nudi, carpo non rugato, manu supra rotundatâ, digitis sat longis, non canaliculatis, digito mobili prope basin armato cum dente crasso obliquo. Pedes postici fere nudi, tarso hirsuto.*

Carapax broad, smooth, nearly flat, not areolate, anteriorly near front margin somewhat impressed; front nearly straight, a little emarginate; antero-lateral margin somewhat acute, nearly entire, very faintly four-lobed; postero-lateral margin straight. Anterior feet a little unequal, smooth, and naked, carpus not rugate, hand rounded above, fingers rather long, not channeled, moveable finger having a large stout basal tooth. Posterior feet nearly naked, tarsus hirsute.

Plate 13, fig. 6 *a*, male, enlarged one and a half diameters; *b*, front view of front, showing outer antennæ; *c*, outer maxilliped; *d*, fingers of hand, one and a half diameters; *e, f*, male and female abdomens, one and a half diameters; *g*, tarsus of second pair of legs, in another specimen; *h*, palate and adjoining parts, enlarged.

Waterland Island, Raraka Island, and elsewhere, Paumotu Archipelago; also Wakes Island, North Pacific.

Length of carapax, in one specimen, 4·3 lines; breadth, 7·1 lines;



ratio, 1 : 1.66. In another, length, 5.5 lines; breadth, 9 lines; ratio, 1 : 1.64. Colour, light brown, often nearly white or dirty white, sometimes purplish; fingers, brownish black. The lobes of the antero-lateral margin are but faintly separated, especially the anterior two; the margin comes to an edge, except towards the orbit. The front is but slightly sinuous, as seen in a vertical view, and does not at all project. In a front view it is also nearly straight, and it shows a furrow quite near the edge. There are a very few hairs on the legs (exclusive of the tarsus, which is more or less hirsute), and these are mostly confined to the lower side of the penult joint. The tarsus of the posterior pair of legs is about half as long as in preceding pairs. The outer maxillipeds have the anterior margin neatly concave.

#### PSEUDOZIUS INORNATUS.

*Pseud. plano carapace affinis. Carapax paulo latior, prope marginem anticum abruptius impressus, margine antero-laterali distinctius 4-lobato. Pedes antici inæqui, carpo leviter rugato. Pedes postici latiores, articulo penultimo supra sparsim hirsuto, tarso hirsuto.*

Near *Pseud. planus* in the carapax, which is a little broader, and more abruptly impressed near the front margin. Anterior feet unequal, carpus a little rugate. Posterior feet also broader, penultimate joint above sparsely hirsute, tarsus hirsute.

Plate 13, fig. 7 *a*, front view, showing outer antennæ; *b*, outer maxilliped; *c*, abdomen, natural size; *d*, extremity of inner branch of first pair of maxillipeds.

Sandwich Islands.

Length of carapax, six and a half lines; greatest breadth, eleven and one-fourth lines; ratio of length to breadth, 1 : 1.73. The specimen is a female, with eggs. The carapax is broader than in the *planus*, and the lobes of the antero-lateral margin are much more distinct, and just posterior to the orbit the margin is quite thick, and the surface is uneven. The anterior margin of the outer maxillipeds is less concave, and the outer margin of the long joint of the fouette

to these maxillipeds is very short fringed. Besides, the eight posterior feet are somewhat hirsute below, and the penult joint is thinly hirsute above, the hairs being mostly in scattered tufts. The fingers of the hand also are much straighter, longer, and more slender, the lower finger in *planus* being twice as long as broad at base, while in the *inornatus* it is more than three times.

Plate 13, fig. 8 *a, b*, represents a specimen from Charlotte's Island, one of the Kingsmill Group, collected along the stony shores, April 24, 1841. The specimen was lost with the wreck of the Peacock, and we cannot, therefore, verify the identity in all points. It agrees with the *inornatus* in general form, and surface of the carapax, antero-lateral and front margin, rugulous carpus, and in the posterior legs. The form is hardly as broad, the hand more rugulous, and the dentation different, the thumb wanting the largish teeth near apex. (This last is a varying character for a species.)

PSEUDOZIUS DISPAR.

*Carapax angustus, lævis, paulo nitidus, omnino usque ad frontem nec areolatus nec inæquabilis, fronte fere recto, leviter emarginato; margine antero-laterali levissimè 3-dentato, dentibus non salientibus. Pedes antici inæqui, major crassus, lævis, nudus, manu supra rotundatâ manu minore minutè tuberculatâ, tuberculis partim paulo seriatis. Pedes postici fere nudi, paucis pilis sparsis.*

Carapax narrow, smooth, somewhat shining, not at all areolate or uneven in any part, front nearly straight, faintly emarginate; antero-lateral margin with three minute dentations. Anterior feet unequal, the larger stout, smooth, naked, hand rounded above, smaller hand minute tuberculate, tubercles in part somewhat seriate. Posterior feet nearly naked, a few scattered hairs.

Plate 13, fig. 9 *a*, female, enlarged three diameters; *b*, under view of front.

Sooloo Sea.

Length of carapax of female, 3·3 lines; greatest breadth, 4 lines;



ratio of length to breadth, 1 : 1.21. The resemblance to the *planus* is close, but the species is much narrower, and the smaller hand is minute tuberculate, instead of smooth, like the larger hand. The finger of the larger hand is smooth and round, and not channeled. The hairs of the eight posterior legs are few and distant, and are mostly confined to the fourth and fifth joints. The tarsus is somewhat hirsute on the upper and under side. The moveable finger of the large hand has not a large basal tooth.

GENUS PILUMNUS, *Leach.*

PILUMNUS VESPERTILIO (*Fabr.*), *Leach.*

Straits of Balabac.

PILUMNUS GLOBOSUS.

*Carapax valde convexus, suborbicularis, parce transversus, non areolatus, vix granulatus, breviter pubescens, fronte emarginato; margine anterolaterali fere integro, dentibus minutis tribus vel quatuor granuliformibus, isolatis. Pedes antici crassi, inæqui, omnino hirsuti et minutè tuberculati, tuberculis nullis seriatis. Pedes 8 postici omnino hirsuti.*

Carapax very convex, suborbicular, sparingly transverse, not areolate, hardly at all granulous, short pubescent; front emarginate, anterolateral margin nearly entire, teeth three or four, minute, granuliform, isolated. Anterior feet very stout, unequal, wholly hirsute, and minutely tuberculate, none of the tubercles seriate. Eight posterior feet wholly hirsute.

Plate 13, fig. 10, female, enlarged three diameters.

Island of Tahiti; also Waterland and Raraka, Paumotu Group.

Length of carapax of a female, five and a half lines; greatest breadth, six and a half lines; ratio of length to breadth, 1 : 1.2. In a male, length, five lines; breadth, six lines; ratio, 1 : 1.2. The out-

line of the front and antero-lateral margins together is very regularly semicircular. The thickness of the larger hand is equal to half the breadth of the carapax. The inner margin of the hand and carpus is very regularly set with a range of longish hairs. The under surface of the larger hand is granulous (or tuberculous), but not hirsute. The female specimen has eggs under the abdomen.

PILUMNUS LEVIMANUS.

*Carapax convexiusculus, non areolatus, anticè vix lævis, fronte emarginato; margine antero-laterali 3-dentato angulo orbitæ externo vix prominente excluso, dentibus minutis, non acutis. Pedes antici valde inæqui, carpo obsoletè tuberculato, manu majore crassâ, nudâ, lævi, extus non costatâ, minore hirsutâ et minutè tuberculatâ. Pedes 8 postici partim hirsuti.*

Carapax somewhat convex, not areolate, hardly smooth anteriorly; front emarginate; antero-lateral margin three-toothed, teeth minute, not acute, outer angle of orbit but very slightly prominent. Anterior feet very unequal, carpus faint tuberculate, larger hand stout, naked, smooth, not costate without, smaller hand hirsute and minute tuberculate. Eight posterior feet in part hirsute.

Plate 13, fig. 11 *a*, male, enlarged three diameters; *b*, large hand, enlarged three and a half diameters.

Balabac Passage, north of Borneo.

Length of carapax of a male, 3 lines; greatest breadth, 3.9 lines; ratio of length to breadth, 1:1.3. The carapax is not quite smooth towards the front on the antero-lateral region, and seems to be very slightly pubescent in these parts. The large hand is rounded above and quite smooth, with some faint traces of minute tubercles towards the base. The eight posterior legs are rather slender, with the margins regular, and in part hirsute. The tarsus is but slightly hairy, and is nearly cylindrical.



## PILUMNUS LÆVIS.

*P. levimano affinis, latior. Carapax omnino lævis, nitidus, non areolatus, convexiusculus; fronte emarginato; margine antero-laterali 3-dentato, dentibus minutis spiniformibus, posteriore minimo, angulo orbitæ postico non prominente. Pedes antici valde inæqui, carpo lævi, non obsolete tuberculato, manu majore omnino lævi, minore sparsim hirsutâ, non tuberculatâ. Pedes 8 postici tenues, paulo hirsuti.*

Near *P. levimanus*, but broader. Carapax smooth and shining, not areolate, rather convex; front emarginate; antero-lateral margin three-toothed, the teeth minute and like spines, the posterior much the smallest, outer angle of orbit not raised into a tooth. Anterior feet very unequal, carpus smooth, not even faint tuberculate; larger hand wholly smooth, smaller sparsely hirsute, not at all tuberculate. Posterior eight feet slender, somewhat hirsute.

Form very near the *P. levimanus*, but shorter for the breadth.

Mangsi Islands, Straits of Balabac.

Length of carapax of a female, 2.1 lines; greatest breadth, 2.95 lines; ratio of length to breadth, 1:1.4. The absence of a faint tuberculation, from the carpus of the larger of the anterior feet, and also from the smaller hand, is characteristic of this species. The eight posterior feet are quite slender, and very distinctly hirsute on some of the joints, the hairs being considerably longer than the diameter of the joints. The antero-lateral margin is quite short, and the postero-lateral is nearly longitudinal.

## PILUMNUS CALCULOSUS.

*Carapax convexiusculus, anticè non areolatus, paulo inæquabilis et pubescens; fronte emarginato; margine antero-laterali perbrevis, 4-dentato, dente postico minimo, ceteris crassiusculis; margine orbitali inferiore tridentato. Pedes antici subæqui, carpo tuberculis paucis grandibus*

*elongatis nudis complanatis armato et inter tuberculos hirsuto, manu supra æquè armatâ. Pedes 8 postici hirsuti, articulis 4to 5toque supra gibbosis.*

Carapax somewhat convex, not areolate anteriorly, somewhat uneven and short hairy; front emarginate; antero-lateral margin very short, four-toothed, posterior tooth minute, the others rather stout; inferior orbital margin three-toothed. Anterior feet subequal, carpus armed with a few large tubercles, which are naked and flattened, between the tubercles hirsute, hand above with similar tubercles. Posterior eight feet hirsute, fourth and fifth joints above, gibbous.

Plate 13, fig. 12 *a*, female, enlarged three diameters; *b*, under view of part of front; *c*, outer maxilliped.

Madeira?

Length of carapax of female, three and one-fourth lines; greatest breadth, four and one-fourth lines; ratio of length to breadth, 1 : 1.3. The large, oblong, naked tubercles of the carpus lie along the surface, and those above are only five or six in number. Three similar, but more rounded, form the upper edge of the hand. The anterior part of the carapax is covered with scattered hairs, which, however, may disappear in larger specimens, if those under examination were young individuals. On the carapax, a short distance from each of the two prominent lateral teeth, there is a low tubercle. Of the three teeth of the inferior orbital margin, the inner is large and flat, with a rounded summit.

#### PILUMNUS TENELLUS.

*Carapax pedesque toti subtilissimè omnino tomentosi. Carapax convexiusculus, non areolatus, fere quadratus, paulo transversus; fronte emarginato; margine antero-laterali perbrevis, 3-dentato, dentibus minutis spiniformibus, posteriore minimo. Pedes antici non tuberculati, 8 postici pertenués, tarso subtilissimè pubescente.*

Carapax and all the feet covered with an exceedingly short tomentose



coat. Carapax somewhat convex, not areolate, nearly quadrate, a little transverse; front emarginate; antero-lateral margin very short, three-toothed, the teeth minute spines, posterior one much the smallest. Anterior feet not tuberculate; eight posterior feet quite slender, tarsus mostly covered with a very minute pubescence, like that of the legs and carapax.

Plate 13, fig. 13 *a*, outline of antero-lateral margin; *b*, leg of posterior pair, enlarged three diameters.

Sooloo Sea, or Straits of Balabac.

Length of carapax, 2.4 lines; greatest breadth, 3 lines; ratio of length to breadth, 1 : 1.25. The pubescence or tomentose covering is exceedingly short, and covers uniformly the carapax and legs; on the posterior legs, which are quite slender, its length is not equal to one-fourth the diameter of the fifth joint. The sternum, abdomen, pterygostomial region, and outer maxillipeds, are covered with the same kind of pubescence. The fingers are light-coloured.

#### PILUMNUS MUS.

*P. ursulo affinis, carapace pedibusque densè crassequè lanatis, capillis tubulatis. Carapax parce granulatus. Frons fimbriâ longâ ornatus. Margo antero-lateralis crassè tridentato, dente altero brevi inter duos anteriores infra insito. Pedes antici inæqui, manu minutè tuberculatâ, tuberculis superficiei externæ seriatis.*

Near *P. ursulus*, carapax and feet being densely covered throughout with long, coarse hairs, which are tubular. Surface of carapax slightly granulate. Front with a long fringe of similar hairs. Antero-lateral margin stout three-dentate, another short tooth, situated on a lower line, between the two anterior teeth. Anterior feet unequal, hand minutely tuberculate, tubercles of the outer surface seriate.

Tongatabu and Samoan Islands.

Length of the carapax of a male, eleven and one-half lines; greatest

breadth, sixteen lines; ratio of length to breadth, 1:1.4. This species has not the close-set tubercles of the *ursulus*, nor its division of the frontal hairs into five groups. The hand is without spines, and thus, as also, in other respects, it differs from the *lanatus*. The front between the outer antennæ is two-lobed, the lobes entire, and slightly arcuate in outline. The teeth of the antero-lateral margin are large and triangular, but are not visible until the hairs are removed.

GENUS PILUMNOIDES, *Edwards and Lucas.*

The ridges on the palate in *Pilumnoides*, are very distinct. The body in the known species is quite thick, with the areolets much subdivided, and the lateral teeth small and reflexed. The lateral margin is rounded, instead of forming an angle between the antero-lateral and postero-lateral parts.

PILUMNOIDES PERLATUS, *Edwards and Lucas.*

Valparaiso, Chili.

Length of carapax, seven and a half lines; greatest breadth, nine and a half lines; ratio of length to breadth, 1:1.27. The anterior part of the carapax has a semicircular outline, and the antero-lateral margin, which is narrow and reflexed, curves around upon the posterior part of the carapax; the whole area thus enclosed between the front and this margin, has a transverse-elliptical outline, and is much cut up into minor areolets, the normal areolets being subdivided. The areolets 2 M, 3 M, 4 M are distinct in outline; 5 L is much broken into ridglets. The teeth of the antero-lateral margin are all small; five are larger than the others (D, E, N, T, S), and between each there are one or two smaller, besides one or two posterior to S. The anterior legs are very stout, and small tuberculous. The hand on the outer surface has three slender costæ; the lower surface is smooth. Front emarginate.

*Hepatus perlatus*, PÆPPIG, Archiv für Nat., 1836, 135, pl. 4, f. 2.

*Pilumnoides perlatus*, EDWARDS and LUCAS, D'Orb. S. A. Crust., p. 21, pl. 9, f. 1.



GENUS MELIA, *Edwards.*

The subquadrate form in Melia is Grapsoid; yet the species, as shown by Milne Edwards (Crust., i. 431), has the outer maxillipeds of the Cancridæ, and the male verges are similar in position. Moreover, as we have observed, the palate has the two ridges of the Eriphidæ. The buccal area is nearly square, being a very little broader than long. The outer maxillipeds are not closely in contact by their inner margins, and the outer angle of the third joint is rounded. The legs in the known species are rather long, and the hand slender; the tarsus is but little curved, and not spinulous.

GENUS MELIA, *Latreille.*MELIA TESSELLATA (*Latreille*), *Edw.*

Plate 14, fig. 1 *a*, female, enlarged two and one-third diameters; *b*, under view of front; *c*, front view of front; *d*, female abdomen, enlarged two diameters.

From the coral reef of Wakes Island, North Pacific, Dec. 20, 1841.

The figure of this species in Milne Edwards's Crustacés, pl. 18 (fig. 8), is evidently coloured from a dried or alcoholic specimen, like most other figures of Crustacea extant, and does not do justice to this beautiful species. The carapax of the specimen collected by us was marked with a few large polygonal areas, separated by dark purple lines or bands. The three anterior of the areas are vermilion; the lateral either side are tinged with vermilion; the two posterior are yellowish with a small vermilion spot at centre. The legs have a light flesh tint, with *two* narrow carmine bands on each joint.

The carapax is but little shorter than broad, and nearly rectangular. The margin either side is nearly straight, inclining a little inward, and anteriorly, a short distance back of the orbits, the posterolateral margin terminates in a tooth, projecting forward. The carapax between the eyes is about half its greatest breadth. The front

margin has a slight indentation at centre, and another near the orbits. Along a transverse line just anterior to a line between the lateral teeth, there is an abrupt depression in the carapax. Quite near the front margin there are two small tufts of short hairs, and also other two on the angle of the abrupt depression in the surface of the carapax just alluded to.

The basal joint of the outer antennæ is much the largest, and sub-cylindrical. The apex of the base projects beyond the front margin of the carapax; the flagellum is as long as the front margin.

*Melia tessellata*, M. EDWARDS, Crustacés, i. 431, pl. 18, figs. 8, 9, and Cuv., pl. 15, f. 3.

#### SUBFAMILY II. ACTUMNINÆ.

##### GENUS ACTUMNUS.

*Carapax angustus valde convexus, fronte et lateribus curvatim declivis. Area prælabialis lineâ elevatâ bene subdivisa. Articulus antennarum externarum Imus processum frontis oblongum attingens tantum. Digiti breves.*

Carapax narrow, very convex, anteriorly and laterally curving downward. Prælabial area subdivided quite across by an elevated line. First joint of outer antennæ reaching barely an oblong process of the front. Fingers short and excavate spoon-like, as in *Actæa*.

The species have the aspect of a narrow, nearly globose ACTÆA, and one of them is granulous, like several of that genus. They also resemble the Pilumni, from which they differ in the excavate fingers. The postero-lateral margins, in the species known, are very much concave, with a smoothish or smooth surface. The name alludes to the intermediate character of the species between Actæa and Pilumnus.

##### ACTUMNUS TOMENTOSUS.

*Carapax angustus, valde convexus, subglobosus, subtiliter tomentosus, anticè leviter partim areolatus; fronte emarginato; margine antero-*



*lateralì leviter 4-lobato, margine postero-lateralì concavo, lævi. Pedes antici crassi, subæqui, subtilissimè tomentosi, minutè tuberculati, digitis brevibus, dentibus eorum contiguis et non hiantibus. Pedes 8 postici æquè tomentosi, posteriores paulo dorsales.*

Carapax narrow, very convex and subglobular, very minute tomentose, anterior portion in part faint areolate; front emarginate; antero-lateral margin very short four-lobed; postero-lateral margin concave, smooth. Anterior feet stout, subequal, tomentose like the carapax, minutely tuberculate, fingers short, their teeth contiguous and not gaping. Posterior eight feet also tomentose, posterior pair subdorsal.

Plate 14, fig. 2*a*, female, enlarged two diameters; *b*, under view of front; *c*, hand.

Tahiti or Upolu, Pacific Ocean.

Length of carapax of female, 4·1 lines; breadth, 5·1 lines; ratio of length to breadth, 1 : 1·24. The habit is that of a *Pilumnus*, and still it is more like a narrow *Zozymus*, as the surface is convex in all its sections. The frontal process reaching to the base of the outer antennæ is elongate, and the joint only reaches it, as seen in fig. 2*b*. The thumb of the hand is very short and stout; the teeth form a cutting edge raised considerably above the extremity of the finger, and thus meets the dentate edge of the moveable finger when the two are closed. The moveable finger has the upper side scabrous. At the outer angle of the orbit below, there is an imperfect fissure, approaching that of a *Panopæus*.

#### ACTUMNUS OBESUS.

*Carapax maximè convexus, suborbicularis, anticè leviter areolatus, areolis planis, granulosis, 2 M non subdivisâ, granulis nudis, interstitiis et sulcis subtilissimè velutinis; fronte paululo producto, emarginato; margine antero-lateralì arcuato, fere integro, levissimè 4-lobato, lobis minutè denticulatis; margine postero-lateralì valde concavo. Pedes antici crassi, manu ucic supra instructâ, valde granulôsâ, granulis vix*

*seriatis, superioribus paulo elongatis et acutis, digito mobili spinuloso-granulato, pollice perbrevis. Pedes 8 postici valde compressi, minutè velutini, marginibus hirsutis.*

Carapax very much convex, suborbicular, anterior regions faint areolate, areolets plane, granulose, 2 M not subdivided, granules naked, interstices and sulci with an extremely short velvety coating; front a little projecting, emarginate; antero-lateral margin arcuate, almost entire, very faintly four-lobed, lobes minutely denticulate; postero-lateral margin much concave. Anterior feet stout, hand having an edge above, surface set with granules, the granules above somewhat elongated and acute, subspiniform, moveable finger spinuloso-granulate, thumb very short. Eight posterior feet much compressed, minutely velvety, margins hirsute.

Plate 14, fig. 3 *a*, animal, enlarged two diameters; *b*, left hand.

Dredged at Lahaina, Island of Maui, Hawaiian Group.

Length of carapax; six and a half lines; breadth, eight and a half lines; ratio of length to breadth, 1:1.3. The velvety coating is shorter than the granules, which are naked and polished, and quite small. The antero-lateral edge does not appear to be lobed, except when carefully examined. The female abdomen is velvety, excepting the middle portion; the outer maxillipeds are naked. The granules of the hand cover closely the under surface, which, as well as the lower part of the outer surface, is otherwise naked. The tarsi are very hirsute on all sides. Each of the fingers has a tuft of hairs a short distance from the tip, and the tips are blunt and only imperfectly spoon-like. The areolets 2 L, 3 L are not separate; 5 L, 6 L are separate. 3 M is not divided. The surface of the carapax against which the posterior legs rub is very broad and smooth, and forms an angle with the upper surface of the carapax.

### SUBFAMILY III. ERIPHINÆ.

#### GENUS RUPPELLIA.

The Ruppelliæ have a semicircular emargination of the front



margin of the buccal area, like the *Eriphiæ*, as a termination of the efferent canal. They are rather broader species, with a less abrupt front, though otherwise closely related. *Eudora* of De Haan (*Faun. Japon.*, p. 22), corresponds in part to this genus, as remarked upon on pages 72 and 145.

RUPPELLIA ANNULIPES? *Edwards.*

Plate 14, fig. 4 *a*, animal, natural size; *b*, under view; *c*, extremity of abdomen of female.

From Charlotte's Island, Kingsmill Group, North Pacific; also Tahiti, Society Islands.

The specimens have five antero-lateral teeth, besides the orbital margin; they are low and obtuse, but have not a crest, as mentioned by Edwards in his description of the *annulipes*. The first tooth belongs properly to the orbital border, although a little distant, and the series is therefore D, D', E, N, T, S. Areolets 1 M and 2 M are united, and anteriorly are prominent, though hardly limited behind. The antero-lateral region is neatly subdivided into three areolets, the anterior 1 L, the next corresponding to 2 L, 3 L, and the posterior to 5 L. 6 L is not distinct, neither are any of the posterior areolets. The surface is not shining, and under a lens appears granulous. The legs are naked throughout, excepting a few very short hairs on the under side of the tarsus. The hand under a lens appears faint granulous; or this is at least true of the smaller hand. The fingers are slender and not at all channeled. The outer maxillipeds have the anterior margin concave opposite the efferent branchial aperture.

The colour of the carapax varies from sienna to dirty brown, or consists of the former clouded with brown. The posterior eight legs are yellowish, banded with purple. The hand is dotted above with brownish purple.

GENUS ERIPHIA.

In the *Eriphiæ* the posterior regions are not subdivided, and part or all of the antero-lateral areolets are wanting. The præmedial and

extramedial are usually coalescent, and the latter, with the intramedial, may or may not be distinct. Areolet 1 L is sometimes present as a tubercle, or spine, and 2 L and 3 L united, at times constitute a distinct areolet, the sulcus behind terminating between the third and fourth marginal teeth or spines. Traces of 5 L, 6 L are occasionally apparent. The teeth or spines of the antero-lateral margin are usually *six* and sometimes *seven*. We infer from the teeth of a *Ruppellia*, that the first and second are both orbital (or D, D'), and the following four are E, N, T, S; and a posterior one when present, *s'*.

## ERIPHIA SCABRICULA.

*Carapax partim scabriculus, areolâ 3 M circumscriptâ, 2 M 1 M 2 F coalitis, non transversim rugatis, regione antero-laterali non areolato; fronte integro, subtilissimè denticulato; margine orbitali nec infra nec supra spinuloso, extus 1-dentato; margine antero-laterali subacuto, 4-spinuloso (angulo orbitali excluso). Pedes antici omnino scabriculi manu carpoque pubescentibus; digito mobili cum dente basali paulo grandi armato. Pedes postici subtenués, paulo hirsuti.*

Carapax in part scabrous, areolet 3 M circumscribed, 2 M, 1 M, 2 F coalescent, not transversely corrugate, antero-lateral margin not areolate, front entire, very minutely denticulate; orbital margin neither above nor below spinulous, exteriorly one-toothed; antero-lateral margin subacute, four-spinous, orbital angle excluded. Anterior feet throughout scabrous, hand and carpus pubescent; moveable finger armed with a large basal tooth. Posterior feet rather slender, somewhat hirsute.

Plate 14, fig. 5 *a*, male, enlarged one and a half diameters; *b*, under view of front and mouth.

Feejee Islands; also Society Islands, and Sooloo Sea.

Length of carapax of a male, six and three-fourths lines; greatest breadth, ten lines; ratio of length to breadth, 1 : 1.48. A specimen from Tahiti had a grayish colour clouded with brown; four posterior legs yellowish, with broad bands of deep brown, or brownish red.



The antero-lateral region is without areolets, excepting a small oblique areolet behind the orbit, not reaching towards the margin. The surface from the front margin to the posterior part of 2 M is evenly curved, without sulci dividing it into areolets. The hands are not very unequal in size.

#### ERIPHIA ARMATA.

*Mediocriter crassa.* Carapax anticè transversim paulo rugatus, margine areolarum 1 M 2 M et 5 L antico per rugam granulosam transversam conspicuis, areolâ 2 L + 3 L circumscriptâ, spinosâ; fronte paulo deflexo, emarginato, denticulato, denticulis parvulis conicis; regione orbitali interno 1-2-spinoso, ejus margine externo 2-3-spinoso, margine superno subtiliter denticulato; margine antero-laterali carapacis subacuto, 5-spinoso (spinis orbitæ exclusis), spinis acutis. Pedes antichi spinulis valde armati et extus hirsuti, manu majore extus seriatim spinulosâ, infra lævi, digito ejus mobili cum dente magno obliquo infra armato. Pedes postici hirsuti.

Moderately stout. Carapax anteriorly transversely corrugate, anterior margin of areolets 1 M, 2 M and 5 L distinct through transverse granulous rugæ, areolet 2 L+3 L together circumscribed, spinulous; front a little deflexed, emarginate, denticulate, teeth small conical; inner orbital region one or two-spinous, its outer margin two or three-spinous, upper margin finely denticulate; antero-lateral margin of carapax subacute, five-spinous spines of orbit excluded, spines acute. Anterior feet armed with spinules, and exteriorly hirsute, hand rather large, seriatly spinulous on outer surface, smooth below, the moveable finger having a large stout basal tooth. Posterior feet hirsute.

Plate 14, fig. 6 *a*, female, natural size; *b*, front view (a little oblique) of front; *c*, moveable finger of larger hand; *d*, abdomen of female.

Rio Negro, eastern coast of Patagonia.

Length of carapax of female, nine and a half lines; greatest breadth, thirteen and three-fourths lines; ratio of length to breadth, 1 : 1.45.

This species has the areolet 2 L 3 L very distinct, and this character, together with the transverse ridgelets, hirsute anterior legs, and general form, distinguish it from the *E. Smithii*. One of the ridgelets or rugæ extends inward, nearly transversely (inclining somewhat forward) from the penult lateral spine; another interrupted range crosses the carapax by the front of 2 M, another by the front of 1 M, and a minute range marks the anterior limit of 2 F. The marginal teeth have often a spine on the posterior side. From the *spiniifrons* it differs in having the teeth of the front quite minute, and the hands and carpus thickly armed with spines, as well as pubescent. Moreover, it is broader for its length. The postero-lateral margin is rounded. The large oblique basal tooth of the moveable finger is alike in both sexes. There is a spine on the lower margin of the orbit, inner side.

ERIPHIA LEVIMANA (*Latr.*)

*Valde obesa. Carapax anticè multo deflexus, areolâ 3 M circumscriptâ, 1 M 2 M coalitis, granulatis, regione antero-laterali nec anticè nec posticè areolato, granulato; fronte inter-antennali bilobato, 3-4-dentato, dentibus brevibus, obtusis; margine orbitali supra denticulato, externè bidentato, margine antero-laterali 5-6-dentato (dentibus orbitæ exclusis), dentibus parvulis, vix acutis, posterioribus granuliformibus. Pedes antichi crassissimi, inæqui, nudi, læves, digitis ambobus manus grandioris dente brevi latissimo basali instructis. Pedes 8 postici articulorum 3ti 4ti 5ti dorso paulo hirsuti, tarso in 4 lineis hirsuto.*

Very thick. Carapax anteriorly much deflexed, areolet 3 M circumscribed; 1 M, 2 M coalescent, granulate, antero-lateral region not areolate in any part, granulous; front between the antennæ two-lobed, 3-4-toothed, teeth short, obtuse; orbital margin above denticulate, externally bidentate, antero-lateral margin with five or six teeth (teeth of orbit excluded), teeth small, hardly acute, the posterior granuliform. Anterior feet very stout, unequal, nude, smooth, both fingers of larger hand having a very stout basal tooth. Eight posterior feet a little hirsute on upper side of third, fourth, and fifth joints, tarsus hirsute in four lines.

Plate 14, fig. 7 *a*, male, natural size; *b*, under view of front; *c*, front view of front.



From several of the Paumotu Islands, as Honden Island, Wilson's; also the Society, Samoan, and Feejee Islands, being widely spread in the Pacific.

Length of the carapax of a female, twenty-two and a half lines; greatest breadth, twenty-nine lines; ratio of length to breadth, 1:1.29. The teeth of the lateral margin do not project so as to add to the breadth of the widest part of the carapax, they are small, and the posterior mere granules. The two teeth at the outer angle of the orbit are quite prominent in a large specimen, though not acute. The eyes are red, much like red sealing-wax.

The figure of this species by Guerin (Iconog. Crust., pl. 3, fig. 1), is very unlike our specimens, especially the representation of the front (1 c), as seen from below; yet we are disposed to refer our specimens here, as they agree exactly with the description by Milne Edwards (Crust., i. 427). The general form, and most of the characters, agree with the *E. Smithii* of M'Leay, as figured by Krauss (Südaf. Crust., pl. 2, f. 3), and Krauss observes that the male hands in that species are smooth. But in the Pacific specimen the hands are smooth in both sexes, and even in individuals half an inch long. The carapax is very thick and rounded at the sides, even along the antero-lateral margin, excepting its anterior part. In a front view, we observe that the suture between the orbit and the outer antennæ is very much flexed, which is not the case in the following species.

#### ERIPHIA GONAGRA.

Coast of South America, and probably Rio Janeiro.

Length of carapax of a male, fourteen and a half lines; greatest breadth, including teeth, twenty-one lines (the teeth adding one line to the breadth); ratio of length to breadth, 1:1.45 (excluding teeth, 1:1.4). Another smaller male, eight lines long, gives for the first ratio, 1:1.41. The teeth are stout and pointed, and have a somewhat tuberculous surface, as in figure 8, Plate 14; there is but a single post-orbital spine. The upper margin of the orbit is very finely denticulate. Areolets 3 M and 2 M (the latter united to 1 M), are distinct; so also a transverse areolet, posterior to the orbits, corresponding to 2 L + 3 L

is prominent. The anterior margin of 1M 2M, and 2L 3L, is somewhat denticulate, and there are some ranges of granules, sometimes raised into ridgelets, on the surface of these areolets, and also near the posterior teeth. From the posterior tooth backward the margin hardly forms an angle. The tubercles of the large hand are flat warts, and are not found on the lower half of the hand; those of the smaller hand are somewhat conical. Both hand and carpus are without hairs. The eight posterior legs are sparsely hairy on the margins of the fourth and fifth joints; and the tarsus is short hirsute in longitudinal lines or bands. The moveable finger of the large hand has a large basal tuberculiform tooth.

ERIPHIA SMITHII (*M'Leay*).

Singapore.

Length of carapax of a male, one inch five and one-fourth lines; breadth, one inch ten and one-fourth lines; ratio of length to breadth, 1 : 1.3. The carpus and hands are covered with very small tubercles or incipient spines, which are smallest and in part obsolescent on the carpus of the larger leg. The figure of Krauss well represents the species.

*E. Smithii*, M'LEAY, Smith's Illustr. Zool. S. Africa, Annulosa, page 60; KRAUSS, Südaf. Crust., p. 36, pl. 2, f. 3.

GENUS DOMÆCIA, *Eydoux and Souleyet*.

This genus, although near *Ruppellia*, is singular in its very short third joint to the outer maxillipeds.

DOMÆCIA HISPIDA, *Eydoux and Souleyet*.

Coral reefs, island of Tahiti.

The species collected by us in Tahiti, appears to be the same with that described by Eydoux and Souleyet, Voy. de la Bonite, pl. 2, figs.



5-10, and Hombron and Jacquenot, *Voy. au Pole Sud.*, Plate 4, figs. 3-7. In our specimen, the length of the carapax was 4.1 lines; greatest breadth, 5.75 lines; ratio of length to breadth, 1:1.41. Colour of carapax, brown, or brownish yellow clouded with brown. The front is slightly convex, and has a length a little exceeding the breadth of the buccal area; it is imperfectly six-lobed, the two inner lobes narrowest, and all spinulous, with the spiniform teeth largest near the orbits, and a little incurved. Antero-lateral margin with four or five small spiniform teeth, and a few additional spines on the surface adjoining. Surface of carapax without distinct areas, slightly pubescent, somewhat shining. The orbits closed as in *Ruppellia*. Outer antennæ short. Inner antennæ in transverse fossæ. Outer maxillipeds with inner margins in close contact, third joint very short, and having a transverse row of spinules; in an under view, the maxillipeds are thrown so far forward as to conceal the inner antennæ. Inner and outer surface of hand smooth and shining, upper margin broad and finely spinous; carpus spinous. Eight posterior legs hirsute above. Abdomen of female broad elliptical, covering the whole space between the basal joints of the legs.

GENUS TRAPEZIA, *Latreille*.

The genus *Trapezia*, as accepted by authors, includes two genera, one of which is here named *Tetralia*. In both genera, the carapax is subquadrate, smooth and shining, with the sides converging posteriorly from near the middle, the front horizontal and broad; the eyes occupy the angles, and the outer antennæ are excluded from the orbit. The true *Trapeziæ* have the following distinctive characters:—

Outer maxillipeds widely separate anterior to middle of second joint, and posterior margin of second joint nearly or quite transverse. Front margin of buccal area (see Plate 15) with an emargination, which terminates the efferent canal. Abdomen of male five to seven-jointed. Anterior legs with the arm much projecting beyond the body, and acute or nearly so at inner apex; the hand not strongly bent downward at its extremity. Tarsus not unguiculate, truncate at apex and spinulous. Pterygostomial region marked with a line running laterally and backward from near the posterior part of the outer maxillipeds.

The same species varies much in the dentation of the arm, even the right and left arm being often much unlike. Moreover the spine of the lateral margin, and that of the inner margin of the carpus, may become blunt, or almost disappear with age. It is, therefore, exceedingly difficult to determine how far these points may afford specific characters. The colour is various among the species, and seemingly important; yet we have been unable to test this importance, since specimens differing decidedly in style of colouring, are apparently identical in their other characters. Rüppell\* considers the colour as a specific distinction, and has named several species on this ground, not mentioning other characters.

The character of the tarsus is quite peculiar, as shown in our figures. The extremity is an oblong process with a blunt apex, filled and not hollow. The upper margin of the apex is set with exceedingly short spines, blunt at the point, and other longer spines and hairs are situated as shown in the figures referred to. The pterygostomian region is crossed by a raised line, which begins either side of the buccal area, near its posterior part (fig. 5*d*).

The species, as well as the Tetraliæ, are found among the closely entangled branches or folia of living corals, and are very common in the tropics.

*Grapsillus*, of M'Leay (Smith's *Illust. S. Af.*, *Annulosa*, p. 67), is identical with *Trapezia* of Latreille, as remarked by Krauss (*loc. cit.*, p. 35).

1. *Latera carapacis inermia*.

TRAPEZIA SPECIOSA.

*Frons fere integer, versus oculos et ad medium obsolete emarginatus.*

*Pedes antici subæqui, carpo supra obtuso, articulo tertio apicem internum acuto (rectangulato) et marginem internum denticulato, denticulis subquadratis, minutis. Pedes 8 postici toti tenues, coxis articulisque sequentibus perangustis, subcylindricis.*

Front very nearly entire, obsolete emarginate at middle and also

\* *Krabben des rothen Meeres*, Frankfurt, 1830, p. 27.



near the eyes. Anterior feet subequal; carpus obtuse; arm acute or rectangular at inner apex, and the margin denticulate, teeth quadrate. Eight posterior feet all slender, coxæ and following joints very narrow, subcylindrical.

Plate 15, fig. 1, animal, enlarged.

From the coral reef, Carlshoff Island.

Length, two and a half lines. Colour flesh-red, areolated with a few deep-red irregularly curving lines. These lines form two deep, contiguous U-shape curves over the anterior part of the carapax, adjoining the front margin, which together are somewhat like the letter  $\Xi$ , thus inverted. Anterior legs of the same colour; fingers brownish black. The tarsus is about half as long as the preceding joint.

#### TRAPEZIA BELLA.

*Frons subinteger, obsoletè sinuosus, crenaturis sex obsoletis. Pedes antici subæqui, nudi, carpo obtuso; articulo tertio apicem internum acuto, (rectangulato), marginemque regulariter serrulato, denticulis triangularis. Pedes octo postici graciles, articulis tertio et sequentibus tenuibus, subcylindricis.*

Front subentire, obsoletely sinuous, six obsolete crenatures. Anterior feet subequal, naked; carpus obtuse, third joint with inner apex acute (rectangular), and inner margin regularly serrulate, teeth triangular. Eight posterior feet slender; third and following joints slender, subcylindrical.

Plate 15, fig. 2, animal, enlarged.

Coral reefs of Carlshoff Island, Paumotu Archipelago.

Length, two and a half lines. Colour flesh-red, dotted minutely with deeper red, both over carapax and legs; fingers brownish. This species resembles closely the *speciosa*; but the teeth of the arm are not quadrate. The tarsus is about half the preceding joint in length.

2. *Latera carapacis dente armata.*TRAPEZIA RUFO-PUNCTATA (*Herbst*), *Latr.*

*Frons dentibus sex magnis subacutis armatus, spinula lateris acuta. Pedes antici subæqui, carpo intus valde acuto, articulo tertio apicem internum acuto, incurvato, marginem internum acute serrato, serraturis grandibus subæquis. Pedes 8 postici paulo pubescentes, articulo tertio parce crasso, quinto sat angustiore. Abdomen maris 7-articulatum, segmento secundo angustiore, tertio quartoque latioribus, reliquis decrescentibus, ultimo rotundato, brevioris quam precedens.*

Front armed with six large, prominent teeth. Lateral spine acute. Anterior feet subequal, third joint or arm acutely projecting, and incurved at inner apex, and inner margin with a few large, sharp serratures. Eight posterior feet somewhat pubescent, third joint rather stout, the fifth considerably narrower. Abdomen of male seven-jointed, second segment narrower, third and fourth broader, the rest decreasing in width, the last rounded at apex, shorter than preceding.

Plate 15, fig. 3 *a*, animal, enlarged; *b*, male abdomen.

From outer reef of Tahiti, among branches of coral.

Length of carapax, six lines; breadth, seven lines. Colour ivory white, or a pale flesh tint, with quite large carmine spots rather thickly scattered; legs like carapax. Between the orbits, just back of front margin, there are in a row, six spots; in the three or four following rows, there is a spot on the medial line; but the rows are not regular, especially over the posterior part of the carapax. Length of third joint of posterior legs, two and one-half times its greatest breadth. Claw, smoky yellow; a slight tinge of red in the hand. The spots of colour are much larger than in the *rufopunctata* of *Herbst*, but the teeth of the anterior margin are so similar to those of his species, that we believe our species identical with his. The inner two teeth of the front margin are separated by a rounded concavity,



the next on either side is prominent triangular. The inner acanthus of the orbit is prominent and acute.

*Cancer rufopunctatus*, HERBST, loc. cit., pl. 47, fig. 6.

*Trapezia rufopunctata*, LATREILLE, Encyc., x. 695; HOMBRON and JACQUENOT, Voy. au Pole Sud, pl. 4, f. 8, 9; EYDOUX and SOULEYET, Voy. de la Bonite, pl. 2, f. 3.

TRAPEZIA MACULATA (*M Leay*), *D.*

*Frons sat sinuosus, paulo 6-dentatus. Dens lateralis acutus. Pedes antici grandes, manu nudâ, carpo apicem internum rotundato aut vix acuto, articulo tertio angulum internum rectangulato, marginem internum 5-6-dentato, dentibus interdum denticulatis. Pedes 8 postici sparsim pubescentes, articulo tertio sat angusto.*

Front rather strongly sinuous, and somewhat six-toothed. Lateral tooth acute. Anterior feet large, hand naked, carpus rounded at the inner apex, third joint at inner angle rectangulate, inner margin dentate, teeth broad and truncate, sometimes subdivided. Eight posterior feet sparsely pubescent; third joint rather narrow.

Plate 15, fig. 4 *a*, animal, from Tahiti, enlarged; *b*, front of a Sandwich Island specimen; *c*, arm of same; *d*, arm of another specimen, from the same locality.

From the reefs of Tahiti, among living corals; also from the Sandwich Islands.

Length of Sandwich Island specimen, five and a half lines; breadth, six and a half lines; of Tahiti specimen, length, five lines; breadth, five and one-fourth lines. Colour a grayish or reddish yellow, spotted rather coarsely with rounded, deep-red spots. The coxæ of the eight posterior legs are not three times as long as broad. The legs have a few hairs only towards their extremities.

The different dentation of the arm of the two Sandwich Island specimens may indicate a more important difference than is here admitted; and the Tahitian specimen is somewhat peculiar in its greater

length. The species differs from the *rufopunctata* in its less deeply dentate front, and its obtuse carpus.

*Grapsillus maculatus*, M'LEAY, Crust. of Smith's Illust. Zool. S. Africa, p. 67.

*Trapezia maculatus*, KRAUSS, Südaf. Crust., 36.

*Trapezia guttata*? RÜPPELL, Krabben des rothen Meeres, 27.

*Trapezia tigrina*, EYDOUX and SOULEYET, Voy. de la Bonite, pl. 2, f. 4.

#### TRAPEZIA CYMODOCE (*Guerin*).

*Frons leviter sinuosus. Dens orbitæ inferior non prominens. Dens carapacis lateralis aut obtusus aut obsolescens. Pedes antici subæqui, carpo angulum internum obtuso aut rotundato, brachio dentato. Pedes 8 postici mediocres.*

Front somewhat sinuous. Inferior orbital tooth not prominent. Tooth on either side of carapax obtuse, or nearly wanting. Anterior feet subequal; inner angle of carpus obtuse or rounded, arm dentate. Eight posterior feet of moderate size.

Plate 15, fig. 5 *a*, specimen from Tahiti, enlarged; *b*, abdomen; *c*, outline of front between the orbits, enlarged, of a specimen from the Sandwich Islands; *d*, under view; *e*, male abdomen; *f*, extremity of leg of third pair; *g*, extremity of tarsus; *h*, outline of right arm (*r*, outline of carpus); *i*, outline of left arm of same individual.

Tahiti; also Sandwich Islands.

Length of carapax of Tahiti specimen, four and one-half lines; breadth, five and three-fourths lines; of specimen from the Sandwich Islands, length, five lines; breadth, six lines. From either of the preceding, this species differs in having the lateral tooth of the carapax obtuse or obsolescent, at the same time the inner angle of the carpus is obtuse, and the front is not very strongly sinuous. The colour is orange; fingers, grayish or brownish yellow. The tarsus is shown in figures *f*, *g*. The obtuse short spines at the extremity, in two parallel but imperfect series, have a brownish-yellow colour, and are very different in appearance from the spines behind. The under view, figure *d*, represents the general character of the maxillipeds in the Trapeziaæ.



and shows the emargination of the anterior margin of the buccal area, at the termination of the efferent canal; it is somewhat triangular in form, with the outer side rounded. There is a tooth below, on the interior margin of the orbit, but it is not long and acute in this species. The depressed line on the second joint of the outer maxillipeds is not parallel with the inner margin. The third joint is about as long as broad, and is somewhat rounded at the outer angle.

This is a common species, and agrees with the *cymodoce* of Herbst, as well as that of Guerin, in having the carpus obtuse; and, although Herbst's figure is too broad, we deem it probable that it is his species; and, in either case, it may well receive his name, as applied by Guerin.

*Cancer cymodoce?* HERBST, op. cit., pl. 51, f. 5.

*Trapezia cymodoce*, GUERIN, Voy. de la Coquille, pl. 1, f. 4.

*Trapezia miniata*, HOMBRON and JACQUENOT, Voy. au Pole Sud, pl. 4, f. 10-13.

#### TRAPEZIA DENTATA (*M'Leay*), *Dana*.

*Frons sat sinuosus, dentibus sex prominulis. Dens orbitæ inferior acutus. Dens carapacis lateralis acutus. Pedes antici subæqui, grandes, margine articuli tertii interno acutè serrato, dente acuto apicali curvato. Pedes octo postici sparsim pubescentes mediocres, paulo graciles.*

Front rather strongly sinuous, inferior tooth of orbit, acute. Lateral tooth of carapax acute. Anterior feet subequal, large; inner margin of third joint acutely serrate, and apical tooth curved. Posterior feet sparsely pubescent, moderately stout, rather slender.

Plate 15, fig. 6 *a*, animal, from Tahiti, enlarged; *b*, abdomen of female; *c*, outline of front of specimen, from Tongatabu; *d*, outline of arm and carpus, *ibid*.

From the coral reefs of Tahiti; the Feejees; and Tongatabu.

Length, 0.30 inch; breadth, 0.36 inch; ratio 5:6. Colour, dark ochreous, also brownish, also deep vermilion, also dull purplish blue. Tooth on the front, near the orbital cavity, an acute spine.

Serratures of arm, five or six, acute, curved at apex. Fingers incurved at apex. Eight posterior legs rather slender, length of third joint more than three times its breadth, last three joints sparsely hairy.

Unlike the *cymodoce*, the lateral tooth of the carapax, the inner angle of the carpus, and the inferior orbital tooth, are all acute; and the front margin is rather more sinuous. There are six low prominences to this margin, of which the one next to the outer, either side, is truncate.

*Var. subintegra*.—Plate 15, fig. 7, represents a specimen from Disappointment Island (Paumotus), which has the lateral tooth and inner angle of carpus prominent acute, but the front of the carapax is only very slightly sinuous. The length was three lines. Colour, light orange, bordering on flesh-red. Eggs orange.

*Grapsillus dentatus*, M'LEAY, S. Af. Crust., pl. 3.

#### TRAPEZIA AREOLATA.

*Frons sinuosus, angulo orbitæ inferiore interno subacuto. Pedes antici mediocres, margine articuli tertii interno serrato, dente apicali curvato; carpo angulum internum acuto. Pedes 8 postici sat breves, sparsim pubescentes, tarso paulo brevior quam articulus precedens. Carapax colore brunneo latè areolatus.*

Front sinuous, inner margin of orbit subacute. Anterior feet of moderate size, inner margin of third joint serrate, apical tooth curved; carpus acute within. Eight posterior feet rather short, sparsely pubescent, tarsus a little shorter than preceding joint. Carapax divided into large areas by brown lines.

Plate 15, fig. 8 *a*, animal, enlarged; *b*, abdomen of female.

From corals of outer reef of Tahiti.

Length, three and a half lines; breadth, four lines. Colour brownish or grayish yellow, darker anteriorly, with a coarse network of dark-brown lines, enclosing irregular angular areas. Legs brownish or red-



dish yellow, excepting anterior pair, which resembles carapax. Inner angle of orbital cavity on the front somewhat prolonged and acute, or subacute.

The sinuous front of the carapax has the two inner prominences low triangular, approximate, and separated as in most species by a semi-circular concavity; serratures of arm equal and acute, serratures sometimes slightly serrulate. Length of third joint of posterior legs, a little more than twice the breadth.

The legs are shorter than in the *dentata*, yet the species closely resemble one another, and if the areolation of the colour is not a specific character, this may be only a variety of that species.

*T. septata* (var.?) The areolation is much coarser than in the *areolata*, and the inner angle of the carpus is not acute. It is, perhaps, a variety of the *T. ferruginea*.

Plate 15, fig. 9 *a*, carapax, enlarged; *b*, male abdomen; *c*, arm and carpus in outline.

From the Sooloo Sea.

#### TRAPEZIA FERRUGINEA (Latreille).

*Frons sinuosus, angulo orbitæ interno inferiore obtuso. Dens carapacis lateralis acutus. Pedes antici grandes, carpo apicem internum angulato, non acuto, articulo tertio apicem internum acuto, prominente, marginem internum dentato, denticulis truncatis aut subduplicibus aut serrulatis. Pedes postici paulo graciles, sparsim pubescentes, articulo tertio angusto.*

Front sinuous, inner inferior angle of orbit obtuse. Lateral tooth of carapax acute. Anterior feet large, carpus angulate at inner apex but not acute, third joint prominent acute at inner apex, inner margin dentate, teeth truncate or somewhat double, or serrulate. Posterior feet sparsely pubescent, third joint narrow.

Plate 16, fig. 1 *a*, animal, enlarged; *b*, another variety.



Reefs of Tahiti (fig. 1 *a*), and Upolu, one of the Samoan Islands (fig. 1 *b*); also from the Sooloo Islands.

Length of carapax, four and a half lines; breadth, six lines. Carapax and anterior legs tawny yellow, or with a tinge of carmine; anterior and part of lateral margin of carapax, also margin of anterior legs, and all of eight posterior legs, tinged with carmine. Another variety (Samoa), carapax pearl-white, with a slight flesh tinge, front margin brown; eight posterior legs with brownish red spots or stripes. In some young specimens, the inner apex of carpus is acute and spiniform.

The species is near the *cymodoce*, but the side spine is more prominent acute.

We suspect, that the *T. septata*, from the Sooloo Sea, is only a variety of this species, although so different in colour.

*Trapezia cymodoce*, AUDOUIN, Savigny, op. cit., pl. 5, f. 2.

*Trapezia ferruginea*, LATREILLE, Encyc., x. 695; EDWARDS, Crust., i. 429.

GENUS TETRALIA, Dana.

*Carapace Trapeziaë affinis, superficie glaberrimâ, fronte horizontali latissimo, oculis ad angulos anticos insitis, margine laterali fere longitudinali et posticè introrsum arcuato. Frons subtilitissimè denticulatus. Pedes antici breviores, brachio apicem paulo exserto, pollice valde deflexo; postici extremitate breviter unguiculati. Maxillipes externus marginem posticum valde obliquus, et non transversus, apicibus articularum secundorum paulo remotis. Abdomen maris 7-articulatum.*

Near *Trapezia* in the carapax, the surface being smooth, the front horizontal, very broad, eyes at the angles, lateral margin very nearly longitudinal, and behind arcuate inward. Front very minutely and neatly denticulate. Anterior feet much shorter than in *Trapezia*, extremity of arm little exsert, thumb very much deflexed; posterior feet having a short claw at extremity. Outer maxillipeds very oblique at the posterior margin, instead of transverse, apices of the second joints somewhat remote. Abdomen of male consisting of seven segments.



The species here included, hitherto referred to *Trapezia*, have many striking peculiarities, among which are,—the claw of the tarsus,—the shorter arm,—the hand bent downward at the extremity,—the posterior margins of the outer maxillipeds making a deep triangle with one another, instead of a transverse line nearly,—the less distance between the upper part of the second joint and the third joint of the outer maxillipeds—and seven segments to the male abdomen;—besides, the anterior margin of the buccal area is not at all emarginate for the termination of the efferent branchial canal, although a slightly-raised longitudinal line will be observed upon the praelabial surface. The character of the front is also quite different in the known species; and the third joint or arm of the anterior legs, instead of having an acute anterior apex, is rounded, and instead of being dentate along the whole inner margin, is denticulate only at or near the rounded apical margin. The sides of the carapax are usually without a spine, though not uniformly so. The fingers of the larger hand are in contact at apex, and the lower finger or thumb has a prominent middle to the inner margin; in the smaller hand, they are throughout in contact.

The tarsus is pointed, as seen in a lateral view, and has a horny, claw-like extremity, which same horny texture extends back either side and also below, as shown on Plate 16. About the under surface of the tarsus there are several spinules in pairs and transverse series; and the claw portion is flattened below, with the margin a little raised.

The *Trapezia digitalis*, Edwards, Crust., i. 429, belongs to this genus, and is distinguished, according to the description given, by having the front armed with two small points at middle.

*Tetralia*, DANA, Am. Jour. Sci. [2], xi. 224.

1. *Latera carapacis inermia*.

TETRALIA NIGRIFRONS.

*Frons subtiliter denticulatus, parce sinuosus, medio obsolete bi-lobatus.*  
*Pedes antici valde inæqui, carpo intus spini-acuto. Pedes 8 postici*  
*fere nudi, articulo tertio paris posterioris latissimo, sesqui longiore*  
*quam lato, fere triplo latiore quam articulus quintus.*

Front minutely denticulate, very slightly sinuous, two obsolescent lobes at middle. Anterior feet very unequal, the carpus acute within. Eight posterior feet nearly naked, third joint of posterior pair very broad, its length one and a half times the breadth, nearly three times as broad as the fifth joint.

Plate 16, fig. 2 *a*, animal, enlarged; *b*, outline of front; *c*, exterior maxillipeds; *d*, abdomen.

Coral reefs at Honden Island, Paumotu Archipelago.

Length, two to three lines. Carapax mostly whitish, with the front margin brownish black; legs dark brown.

The front may be said to be obsoletely four-lobed, the two inner lobes short, the outer long; but all are very slightly prominent. The teeth or pectinations on the margin are largest laterally. The apex of the basal portion of the outer antennæ was visible beyond the front in an upper view.

The abdomen was not closely applied to the venter when in its natural state, but appeared a little lax, as shown in the figure. Its form is oblong elliptical; but we are not certain that it was mature. The great breadth of the third joint of the posterior pair of legs is a striking character.

TETRALIA GLABERRIMA (*Herbst*), *Dana*.

*Frons subtilissimè denticulatus, non sinuosus. Pedes antici inæqui, manu extus prope basin pubescente, articulo tertio apicem internum rotundato et ad marginem internum denticulato, carpo apicem internum rotundato. Pedes octo postici fere nudi, articulo tertio paris postici paululo latiore quam articulus quintus, articulo quinto crassiusculo.*

Front very minutely denticulate, not sinuous. Anterior feet unequal, hand externally towards base somewhat pubescent, third joint on inner margin toward apex denticulate, carpus rounded within. Eight posterior feet nearly naked, third joint of posterior pair slightly broader than fifth joint, fifth joint stout.



Plate 16, fig. 3 *a*, animal, enlarged (from Carlshoff Island); *b*, under view of front and mouth; *c*, female abdomen; *d*, male abdomen of a specimen of similar colour, from Tongatabu; *e*, large hand, *ibid.*; *f*, tarsus, *ibid.*; *f'*, under view of extremity of same; *g*, another variety, Tahiti; *i*, *h*, abdomen of same variety.

From coral reefs of Carlshoff Island, Paumotus; also from the reefs of Tahiti, and from Tongatabu.

Colour, chestnut brown, excepting sometimes a border along the front and behind the eyes, which is often pale green, white, or grayish white. Legs brown, also pale yellow, approaching pale flesh-red, with the front margin sometimes brown. Length of carapax of specimen from Tongatabu, five and a half lines; breadth, six and a half lines; of specimen from Carlshoff Island, length, four lines; of Tahiti specimen, length, two and one-fourth lines, and breadth, three lines.

In most specimens, the right hand was very much the largest, as in the figure; but in others, apparently of the same species, the left was much the larger. The front, in the pale species from Tongatabu and Carlshoff, is not at all sinuous; and it is but slightly so in the Tahiti specimen, fig. *g*. The third joint of the posterior legs is less stout proportionally than in the *nigrifrons* (length to breadth, as 1 to 2), and the carpus is not acute within. The female abdomen is very large orbiculato-elliptical, and covers the whole sternum and even the insertions of the legs. The inner apex of the arm is rather evenly denticulate.

*Cancer glaberrimus*, HERBST, *op. cit.*, 262, pl. 20, f. 115.

*Trapezia serratifrons*, HOMBRON and JACQUENOT, *Voy. au Pole Sud*, pl. 4, f. 20-23.

*Trapezia glaberrima*, KRAUSS, *Südaf. Crust.*, 35.

*Trapezia leucodactyla*, RUPPELL, *loc. cit.*, 28.

## 2. *Carapacis latus spinâ armatum.*

### TETRALIA ARMATA.

*Frons subtilissimè denticulatus, non sinuosus. Pedes antici inæqui, manu extus prope basin pubescente, carpo spinis duabus intus armato, articulo tertio prope apicem internum 4 denticulis tenuibus ornato. Pedes postici mediocres, articulo tertio paulo angusto.*

Front very minutely denticulate, not sinuous. Anterior feet unequal, hand externally near base pubescent, carpus armed on the inner side with two spines, third joint having four slender teeth near the inner apical margin. Posterior feet of moderate length, third joint rather narrow.

Plate 16, fig. 4 *a*, carapax, enlarged; *b*, outline of arm and carpus; *c*, part of hand.

Island of Tongatabu, Pacific Ocean.

Length of carapax, two lines; breadth, two and a half lines. Colour pale, with the anterior border brownish black.

NOTE. The *Trapezia digitalis* (M. Edwards's Crust., i. 429) evidently belongs to this genus, and it is distinguished from the others here described, by having the front armed at middle with two small pointed teeth, and elsewhere finely denticulate. The *T. leucodactyla* of Rüppell (loc. cit., p. 28), has not the side tooth, as is usual in the Tetraliæ, but the characters mentioned do not suffice to determine that it is a true Tetralia.

#### GENUS QUADRELLA.

*Carapax convexus, lævis, subquadratus, margine laterali fere longitudinali, fronte lato, horizontali, bene spinoso, oculis ad angulos insitis. Articulus antennæ externæ 1mus perbrevis, secundo non longior, ad frontem non attingens, margine orbitæ hiatus carente exclusus. Pedes longi, posteriores graciles, tarsi unguiculatis.*

Carapax convex, smooth, nearly square, sides nearly longitudinal; front broad, horizontal, regularly spinous, eyes at the angles of the carapax. First joint of outer antennæ, very short, not longer than second, not reaching to front, excluded from margin of orbit, there being no hiatus. Feet long, the posterior quite slender, tarsi unguiculate.

Near Trapezia, but the carapax is convex, the front has six pro-



minent acute teeth, the feet are long, the first joint of the outer antennæ is not longer than the second. The aspect is quite different, the carapax appearing harder, and quite as long as broad. There is a prominent spine at inner side of orbit, below the line of the front, and more prominent than the tooth of the front just above. There are no fissures above in the orbital margin. The arm is long (very nearly as long as the carapax), and projects very much beyond the carapax.

The species have much the aspect of one of the Grapsidæ; but the abdomen and the male sexual appendages are Cancroid, and the resemblance is close to Trapezia.

#### QUADRELLA CORONATA.

*Carapax lævis, lateribus paululum arcuatis et medio uni-spinosis, dentibus frontis sex medianis paulo longioribus, externis perbrevibus, dente infra-orbitali elongato. Pedes antici elongati, manu angustâ, triplo longiore quam dimidium corporis, inermi, lævi, carpo intus 2-spinoso, brachio ad marginem anticum bene 7-spinoso. Pedes postici fere cylindrici, articulis subtilissimè pubescentibus, articulo quinto marginibus parce pubescenti, tarso infra spinuloso.*

Carapax smooth, sides slightly arcuate and with a single spine at middle, teeth of the front six the median longest, and the exterior quite short; an elongate infra-orbital tooth just below outer frontal. Anterior feet elongate; hand narrow, once and a half the length of the body, smooth and unarmed; carpus two-spinose on inner side; arm with a neat series of seven spines. Posterior feet nearly cylindrical, very minutely pubescent, fifth joint sparingly pubescent at the margins, tarsus spinulous below.

Plate 16, fig. 5 *a*, carapax, enlarged three diameters; *b*, under view of part of front, inner antennæ, except a portion of base removed; *c*, anterior leg, enlarged three diameters; *d*, one of eight posterior legs, *ibid.*

Sooloo Sea, or Balabac Straits.

Length of carapax, three and a half lines; breadth, the same; length of hand, five and a half lines; of moveable finger, two and a half lines; of arm, three and one-fourth lines. The post-orbital angle is very short acute. The teeth or spinules of the front are very nearly equally spaced, the interval between the two middle being a little the deepest. The lower finger has the apex incurved and acute. The seven teeth of the arm are acute spines, equally spaced. The eyes have very short peduncles, and project hardly as much as their diameter. The spine at inner angle of orbit below, projects forward nearly as far as the median teeth of the front, and is similar in form.

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#### FAMILY IV. PORTUNIDÆ.

THE genera of Portunidæ, through the description of supposed new types and the subdivision of old genera, have been greatly increased in number beyond those published in the work by Milne Edwards. But some of these supposed new types are of doubtful merit, and the subdivisions in part objectionable. Of the latter, some have been introduced by De Haan, in following out his system of basing distinctions upon the maxillipeds. The difficulties of such a mode of characterizing or arranging genera, have been illustrated by reference to some of the Portunidæ, on pages 73, 74. Some of the genera, however, are well sustained. We refer to the pages mentioned for remarks on these genera, and continue here with a few additional observations.

The mouth organs, when their transitions are studied, scarcely afford satisfactory characters for separating either the *Lupa tranquebarica* or the *hexagonal* Lupa, from the rest. Yet there are other characters of importance, that sustain us in recognising each of these as distinct groups. The *Lupa tranquebarica* has a large massy hand, narrow above, and with bulging sides, not costate; while in the other Lupa, the hand has a trigonal or prismatic form, being strongly costate longitudinally. Moreover, in this species, the epistome is distinct across, posterior to the bases of the antennæ, while in other species, it is obsolete except in its medial portion.



Again, the *hexagonal Lupas* have the second, third, and fourth legs very slender; moreover, the short and large eyes, which are not concealed when retracted, give the crab a staring look. These characters, in connexion with the narrow form, and the transverse front making an angle with the sides, show that they are a distinct group, and belong together, although varying so widely in the outer maxillipeds, as mentioned on page 74. As in the genus *Lupa*, these species may have either a short or a long lateral tooth or spine, this distinction not being of generic importance.

But *Oceanus* is hardly distinct from *Charybdis*, and *Charybdis* graduates into *Thalamita*.

The peculiar character of the *Lupa cribraria*, mentioned on page 62, requires for it a distinct genus and family.

The *Platyonychidæ* are distinct from the *Portunidæ*, not only in the absence of the ridge on the prælabial plate, but also in the absence of the inner lobe to the inner branch of the first maxillipeds; and besides, the first joint of the outer antennæ is moveable and subcylindrical like the following joint.

The genera of *Portunidæ* which appear to stand on good characters are the following. We have doubt as to its being well to separate *Charybdis* and *Thalamita*, as the transitions closely unite them, and their characters are essentially the same.

1. LUPINÆ.—Sutura sterni mediana tria segmenta intersecans.  
Palati colliculi prominentes.

1. *Pars antennæ externæ mobilis hiatus orbitæ non oclusa, in orbitâ jacendo aptata.*

G. 1. SCYLLA, *De Haan*.\*—Valde latus et crassus, marginibus anterioribus simul sumtis bene arcuatis, antero-laterali longiore quam postero-lateralis. Pedes antici breviores, crassissimi, manu valde tumidâ, non angulatâ nec prismaticâ.

G. 2. LUPA, *Leach*.†—Valde latus, marginibus anterioribus totis simul sumtis bene arcuatis. Manus elongatè trigona aut prismatica, costata.

G. 3. AMPHITRITE, *De Haan*,‡ *Dana*.—Angustior. Margines frontalis antero-

\* Faun. Japon., 11.

† *Neptunus*, *Pontus*, and *Achelous* of *De Haan* (Faun. Japon., 8, 9), the distinctions between which genera appear not to be sustained.

‡ Faun. Japon., 8. Includes, as here adopted, the *Lupa* of *De Haan*, which division he restricts to the *Lupa forceps* (*Edw. Crust.*, i. 456). The *Lupocylus* of *Adams* and *White* (*Crust. Voy. Samarang*, 46, pl. 12, f. 4), appears to be identical with *Amphitrite*.

lateralisque angulo convenientes, antero-laterali raro brevior quam postero-lateralis. Manus elongata, prismatica. Basis antennæ externæ crassus, hiatu orbitæ parce angustior.

G. 4. CARUPA, *Dana*.—Transversus. Margines frontalis antero-lateralisque angulo convenientes, fronte recto, medio sæpe emarginato. Basis antennæ externæ subcylindricus, hiatu orbitæ multo angustior.

2. *Pars antennarum externarum mobilis hiatu orbitæ omnino per basis processum occlusa, orbitâ plus minusve remota.*

G. 5. THALAMITA, *Latr.*—Latus. Frons dimidio latitudinis carapacis longior; margo antero-lateralis longitudinalis. Articululus antennæ externæ Imus prælongus, 2dus orbitâ remotissimus. Pedes antici longi, manu elongatâ.

G. 6. CHARYBDIS, *De Haan, Dana*.\*—Angustior. Frons dimidio latitudinis carapacis brevior; margo antero-lateralis obliquus. Articululus antennæ externæ Imus paulo oblongus, 2dus orbitâ paulo remotus. Pedes antici longi, manu elongatâ.

G. 7. LISSOCARCINUS, *White*.†—Suborbiculatus, lævis, subporcellanus. Articululus antennæ externæ Imus brevis, fere longitudinalis, articulo sequente orbitâ parce remoto. Pedes nudi; antici breves, brachio ultra carapacem vix saliente, manu perbrevis.

2. ARENÆINÆ.—Sutura sterni mediana tria segmenta intersecans. Palatum colliculo utrinque non divisum. Ramus maxillipedis Imi internus ad apicem late transversim triangulatus, duobus inter se fere convenientibus.

G. ARENÆUS, *Dana*.—*Lupæ* affinis. Carapax valde latus, antice arcuatus. Pars antennæ externæ mobilis hiatu orbitæ insita. Manus prismatica.

3. PORTUNINÆ.—Sutura sterni mediana duo segmenta intersecans. Colliculi palati sæpe obsoleti.

G. PORTUNUS, *Fabr.*—Angustus, margine antero-laterali brevior quam postero-lateralis.‡

\* Fauna Japon., 10. Includes both *Charybdis* and *Oceanus* of De Haan. Corresponds to the "Thalamites Hexagonales" of Edwards, *Crust.*, i. 461.

† *Crust. Voy. Samarang*, 45. We have taken the generic characters from a species collected by us, in connexion with the description by White.

‡ The above synopsis of Portunidæ, is published by the author in the *Amer. J. Sci.*, [2], xii. 129, 1851.



## SUBFAMILY I. LUPINÆ.

GENUS SCYLLA, *De Haan*.

*Scylla* of De Haan (Faun. Japon., p. 11), corresponds to the first section of the genus *Lupa* in Milne Edwards's Crustacés, i. 448.

SCYLLA TRANQUEBARICA (*Fabr.*)

Singapore.

Ratio of length of carapax, 1 : 1.46 to 1 : 1.5. Medial region but faintly indicated.

*Portunus tranquebaricus*, FABRICIUS, Suppl., 366.

*Portunus serratus*, RUPPELL, Krabben des rothen Meeres, p. 10, pl. 2, f. 1.

*Lupa tranquebarica*, EDWARDS, Crust., i. 448.

*Scylla serrata*, DE HAAN, Crust. Fauna Japonica, 44; KRAUSS, Südaf. Crust., 25.

Var. ? *oceanica* (Plate 16, figs. 6 *a*, *b*, natural size). A specimen closely resembling the *S. tranquebarica*, if not identical with it, was obtained at the Navigator Islands. It has the median emargination of the front narrower and deeper than the next either side; the median region of the carapax a little more distinct than in the *tranquebarica*; male abdomen oblong triangular, its sides from near the base of the third joint to the apex very straight, instead of sinuous as represented by Rüppell.

The length of the carapax is two inches and seven lines; greatest breadth, three inches and ten lines; ratio of length to breadth, 1 : 1.48. There is also from the same islands, in our collections, a carapax of a larger specimen, measuring four inches and eight lines in length, and breadth, six inches ten and a half lines; ratio of length to breadth, 1 : 1.47.

## GENUS LUPA.

De Haan, in his changes, restricted the name *Lupa* to the single

species *Lupa forceps*. We retain it for the typical part of the old genus, as good usage if not law requires. The *Lupa forceps* hardly differs enough from *Amphitrite*, another subdivision of the old genus *Lupa*, to be distinguished as the type of a separate genus. This genus corresponds in the main to De Haan's *Neptunus*.

LUPA PELAGICA (*Linn.*)

Singapore, East Indies.

Length of the carapax of a medium specimen, one inch and four lines; breadth between tips of longest lateral spines, two inches and eleven lines; ratio of length to breadth, 1 : 2·2; breadth between teeth next in advance, two inches and four lines; ratio of length to this breadth, 1 : 1·75.

*Cancer pelagicus*, LINN., Mus. Lud. Ulr., p. 434.

*Lupa pelagica*, LEACH, Edinb. Encyc.; EDWARDS, Crust., i. 450.

LUPA SANGUINOLENTA (*Herbst*), *Desm.*

Singapore, East Indies; also Sandwich Islands.

Length of carapax of a male, two inches and four lines; breadth between extremities of lateral spines, five inches and four lines; ratio of length to this breadth, 1 : 2·3; breadth between the two teeth next anterior to the spine, four inches and four lines; ratio of length to this breadth, 1 : 1·86. Third joint of exterior maxillipeds and pterygostomian region densely pubescent, while the same parts in the *dicantha* are naked; second joint of exterior maxillipeds naked and smooth. Teeth of fingers compressed incisors, each being supported on either side by a very small tooth or lobe; one basal tooth of moveable finger of larger hand, flattened molar in form.

Colour of living animal, yellowish gray with a tinge of green, and large brown areolation; large spots behind brown with a white ring around. Extremity of posterior eight legs blue, with red ciliation;



anterior legs with a large crimson spot on the inside of the moveable finger.

*Cancer sanguinolentus*, HERBST, i. 161, pl. 8, f. 56, 57.

*Lupa sanguinolenta*, DESMAREST, Crust., 99; EDWARDS, Crust., i. 451, and Cuv., pl. 10, f. 1.

*Neptunus sanguinolentus*, DE HAAN, Faun. Japon., 38.

#### LUPA DICANTHA (*Latreille*).

Plate 16, fig. 7 *a*, abdomen of male, natural size; *b*, under view, showing mouth with part of the maxillipeds removed—*e*, the anterior margin of the prælabial plate—*mx*, inner branch of first maxillipeds—*md*, mandibles—*r*, ridge on prælabial plate; *c*, outer maxilliped.

#### Rio Janeiro.

Length of carapax of a male, two inches; breadth between tips of long lateral spine, four and one-half inches; ratio of length to this breadth, 1:2.25; breadth between the tips of the teeth next anterior, three inches and seven lines; ratio of length to this breadth, 1:2.1. In the same male, the breadth of the second joint of the abdomen is seventeen lines, and that of the fourth, which is linear, hardly two lines, making the ratio between the two, 1:9. The third joint of the outer maxillipeds is oblique subtriangular, the outer side being concave in outline, the inner obliquely truncate and convex, and not at all projecting just above the articulation with the next joint, but continuing in an uninterrupted line curving around to the outer apex. The colour of this species as observed at Rio Janeiro, is olive green, with the eight posterior legs in part bluish, and the arm and hand blue, with some reddish purple.

After a close examination of the two varieties of this species, the Brazilian with the median teeth of the front prominent and the other with them obsolete, we incline to the opinion, that they are distinct species, and that therefore, the *L. hastata* of Say will stand as a good species under his name; yet we cannot pronounce with certainty upon this point. The *Lupa hastata* of other authors is an Amphitrite.

*Portunus dicanthus*, LATREILLE, Encyc., x. 190.

*Lupa hastata*? SAY, J. Acad. Nat. Sci. Philad., i. 65.

*Lupa dicantha*, EDWARDS, Crust., i. 451.

LUPA SAYI, *Gibbes.*

Plate 16, fig. 8, abdomen of male, natural size.

Gulf weed, Atlantic Ocean.

Length of carapax of a male, fourteen and a half lines; breadth between tips of long lateral spines, twenty-eight and a half lines; ratio, nearly 1:2; breadth between teeth next anterior, twenty-four lines; ratio, 1:1.66. This is proportionally a much less broad species than the *L. dicantha*. The arm has not the spine at its posterior apex characteristic of that species. The male abdomen is much broader along its fourth joint, its breadth here being greater than one-fourth its basal breadth. The third joint of the outer maxillipeds is much less oblique, and broader at its anterior margin. The four medial of the frontal teeth are very nearly equal. The costæ of the hand are very nearly smooth, and the fingers of neither hand have any broad, rounded teeth near base. There are four spines on the anterior margin of the arm, instead of three as in the *dicantha*; the pterygostomian regions are pubescent, while they are naked or nearly so in the *dicantha*.

*Portunus pelagicus*, Bosc., Hist. Nat. des. Crust., i. 220, tab. 5, f. 3.

*Lupa pelagica*, SAY, Jour. Acad. Nat. Sci. Philad., i. 97; DEKAY, Zool. N. Y., Crust., p. 11, pl. 6, f. 8.

*Lupa Sayi*, L. R. GIBBES, Proc. Amer. Assoc., 1850, at Charleston, p. 178.

LUPA SPINIMANA, *Leach.*

Rio Janeiro, Brazil.

Length of carapax of a male, one inch eight and a half lines; greatest breadth, two inches and ten lines; ratio, 1:1.66. This species has the carapax covered with a short brownish down, except along certain lines and areolets. The medial areolet is often bare in its anterior part (præmedial areolet); also the extra-medial, ante-



riorly over a large surface, and another still larger transverse, behind this; on the intra-medial, the broad part of which has a nearly straight transverse anterior margin; also in a band running from either side of this areolet, curving first forward, and then around to the posterior tooth; also in other parts. The anterior legs are very long, and the arm projects far outside of the carapax.

*Portunus spinimanus*, LATREILLE, Encyc. x. 188.

*Lupa spinimana*, LEACH, DESMAREST, Crust., 98; EDWARDS, Crust., i. 452.

*Achelous spinimanus*, DE HAAN, Faun. Jap., 8.

#### LUPA PUBESCENS.

*Carapax valde convexus, angustior, subtiliter granulatus, breviter hirsutus; fronte angusto, dentibus quatuor subæquis, parvulis, dente præorbitali prominentioribus, emarginatione medianâ profundiore; margine antero-laterali 9-dentato, dente postico plus duplo longiore. Pedes antici breviores, non crassiores, hirsuti, brachio anticè trispinoso et apicem posticum non armato, manu superne trispinosâ, costis valde prominentibus, digito manus majoris mobili cum dente crasso obliquo basali armato.*

Carapax more convex and narrower than usual, finely granulate, short hirsute, front narrow, four small subequal teeth, more prominent than præorbital tooth, median emargination deeper than the next; antero-lateral margin nine-toothed, posterior tooth rather more than twice as long as the others. Anterior feet rather short, but not stouter, hirsute, arm with three spines on its anterior margin, and not armed at its posterior apex, hand with three spines above, ribs very prominent; moveable finger of large hand with a stout and oblique basal tooth.

Plate 16, fig. 9 *a*, carapax, natural size; *b*, hand, enlarged two diameters; *c*, under view, showing prælabial plate, &c., the pubescence removed from the epistome and neighbouring parts, with *a*<sup>2</sup>, outer antennæ—*a*<sup>1</sup>, base of inner antennæ—*e*, epistome—*p*, prælabial plate and medial fissure of the plate—*p*<sup>2</sup>, outer episternal suture of prælabial plate—*f*, *g*, outer parts of mandibular segment—*p*<sup>1</sup>, inner and poste-

rior portion of inner episternal suture, the anterior portion, which properly extends to the margin of the plate just inside of the base of the outer antennæ, being obsolete.

Maui, Sandwich Islands.

Length of carapax, one inch and one line; breadth between tips of larger lateral teeth, one inch and eight lines; ratio of length to this breadth, 1:1.6; breadth between teeth next anterior, one inch six and three-fourths lines; ratio of length to this breadth, 1:1.44. It is thus seen that this is a peculiarly narrow species. A faint line (as seen on the bare carapax) extends from the larger lateral tooth to the anterior outer angle of the intra-medial areolet (3 M), which areolet is faintly brought out. The inner spine of the carpus is long and slender. The four teeth of the front are in pairs, and truncate. The orbital margin below the antennæ has a broad, rounded projection.

GENUS AMPHITRITE (*De Haan*), *Dana*.

*Antennis externis Lupæ similis. Carapax angustus, subhexagonus, marginibus frontali antero-lateralique angulo convenientibus, antero-laterali raro brevior quam postero-lateralis. Oculi breves, grandes, in orbitis non omnino occulti. Manus elongata, subtrigona. Pedes 8 postici graciles.*

Carapax narrow, subhexagonal, the frontal margin forming an angle with the antero-lateral, the antero-lateral rarely shorter than the postero-lateral. Eyes short and large, and when retracted not concealed by the orbits. Hand elongate, subtrigonal. Eight posterior feet slender.

In Amphitrite, the areas of the carapax are often quite prominent. The large eyes having a staring look. The species may have the posterior tooth of the lateral margin like the others, or elongated into a spine. In two species of the latter kind, described beyond, the front is four-toothed, with the two inner teeth quite small. In a species of the former kind, the front is five-toothed.



The genus *Lupocyclus* of Adams and White (Crust. Samarang, p. 46, pl. 12, f. 4), appears to be identical with *Amphitrite*. No characters are mentioned which would exclude the species from that genus, and the figure, not excepting the appearance of the eyes, confirms this conclusion.

1. *Dens lateralis posterior non elongatus.*

AMPHITRITE SPECIOSA.

*Carapax areolatus, parce transversus, nudus, granulatus, fronte interantennali 5-dentato, dente mediano minutissimo, triangulato, proximo non prominente, remotiore prominente, obtuso; margine antero-laterali paulo arcuato, 9-dentato, dentibus alternatim paululo minoribus. Pedes antici sat validi, brachio postice 2-spinoso, antice 4-spinoso, carpo 2-spinoso, manu brevior quam latitudo carapacis, 2-spinosâ, spinâ anteriore brevissimâ vix conspicuâ. Areola carapacis cardiaca bi-partita; intestinalis grandis, tripartita, parte medianâ fere lineari.*

*Carapax* areolate, sparingly transverse, nude, granulate, front between the antennæ five-toothed, the median tooth very minute triangular, the next either side not at all prominent, the next prominent, obtuse; antero-lateral margin nine-dentate, teeth alternately very slightly unequal. Anterior feet of medium size, arm with two spines behind and four before, carpus with two spines; hand shorter than the breadth of the carapax, having two spines, the anterior one very short and hardly distinct. Cardiac areolet of carapax bipartite; intestinal large and tri-partite, the median part nearly linear.

Plate 17, fig. 1 *a*, male, enlarged two diameters; *b*, abdomen; *c*, outer maxilliped; *d*, summit of inner branch of first maxillipeds.

From the Feejee Archipelago, Pacific.

Length of carapax, eight lines; greatest breadth, eleven and one-fourth lines; ratio of length to breadth, 1:1.4. The median point of the front appears to proceed from a low lobe, the teeth either side which

together constitute this lobe scarcely projecting at all beyond the point where the median tooth begins. The antero-lateral margin is ciliate, and also both margins of the arm and the upper margin of the hand inside. The posterior side of the median region is in the same line with the posterior lateral teeth. The male abdomen is quite regularly triangular, a little oblong. On the outer side of the hand there is one very prominent and thin carina. The outer maxillipeds have the third joint oblong, longitudinally concave, and very oblique, it curving outward over the summit of the palpus, and at the same time bending, so as to present, to the front view, a surface instead of an edge. Inner surface of hand, especially the lower half, granulous; under surface nearly flat, smooth, and shining.

This species resembles somewhat the *Amphitrite gladiator* of De Haan, as figured by him on Plate 18, f. 1, though unlike his figure 5 on Plate 1 of the same species. From both it differs in the front, and in other characters.

2. *Dens lateralis posterior valde elongatus.*

AMPHITRITE LONGI-SPINOSA.

*Carapax areolatus, paulo transversus, spinâ laterali diametro carapacis non duplo brevior, paulo reflexâ, dentibus antero-lateralibus 5 (angulo orbitæ excluso), minutis, non contiguis, inter sese subæquè remotis, fronte inter-antennali 4-dentato, dentibus medianis minutis, exterioribus prominenter triangulatis. Pedes antici mediocres, manu supernè 3-spinosâ, carpo 2-spinoso, brachio apicem externum uni-spinoso, marginem anticum 3-spinoso.*

*Carapax* areolate, a little transverse, lateral spine as long as half the breadth of the carapax, somewhat reflexed; antero-lateral teeth five, minute, not contiguous, nearly equally spaced; inter-antennary front four-toothed, the two median teeth minute, the others prominent triangular. Anterior feet of medium size, hand with three spines above. Carpus with two spines, arm with a single spine at the outer apex, and three on the inner margin.

Plate 17, fig. 2*a*, animal, enlarged three diameters; *b*, male abdomen; *c*, outer maxillipeds.



## Coral Reefs of Ovalau, Feejee Archipelago.

Length of carapax, three lines; breadth between tips of lateral spines, six and three-fourths lines; breadth just posterior to the spines, three and a half lines; length of spines, one and a half lines; length of hand, three lines. The second, third, and fourth pairs of legs are very slender. The third joint of the outer maxillipeds is oblong, but nearly flat to its anterior margin, yet somewhat obliquely curved in its anterior part. The length of the male abdomen is much less than its breadth at base.

De Haan's *Amphitrite hastatoides* (F. Jap., Pl. 1, f. 3), and *A. tenuipes* (Pl. 1, f. 4) have no spines on the upper side of the hand.

## AMPHITRITE VIGILANS.

*Carapax areolatus, paulo transversus, granulatus, spinâ laterali fere triplo brevior quam latitudo carapacis, dentibus parvulis antero-lateralibus sex (angulo orbitæ excluso), quatuor posterioribus, duobus anterioribus; fronte 4-dentato, dentibus 2 medianis minutis, exterioribus prominenter triangulatis. Pedes antici mediocres, manu supernè 3-spinosâ, carpo 2-spinoso, brachio apicem externum uni-spinoso, marginem anticum 4-spinoso.*

Carapax areolate, somewhat transverse, granulate; length of lateral spine about one-third the breadth of the carapax, the small antero-lateral teeth six in number, in two sets, four posterior and two anterior; front four-dentate, two inner teeth minute, outer prominent triangular. Anterior feet of moderate size, hand with three spines above, arm with one spine at outer apex and four on the inner margin.

Plate 17, fig. 3 *a*, part of a male, enlarged two diameters; *b*, male abdomen; *c*, outer maxillipeds; *d*, summit of inner branch of first maxillipeds.

Feejee Archipelago; also, Sandwich Islands.

Length of carapax, seven lines; breadth between tips of long

spines, fourteen lines; length of spine, three lines. The two anterior teeth of the antero-lateral margin point nearly forward, while the four posterior, which are separated from the anterior by considerable space, are directed more outward. The abdomen of the male is somewhat oblong, its length exceeding its basal breadth.

GENUS CARUPA, Dana.

*Pedes antici sequentibus vix longiores, 2di 3tii 4tique longi, gracillimi, tarso valde tenui, 5ti bene natatorii, tarso elliptico. Articulus antennæ externæ Imus cylindricus sequenti similis. Carapax transversus.*

Anterior feet hardly longer than the following pairs, second, third, and fourth pairs long and very slender, tarsus very slender, fifth pair natatory, the tarsus elliptical. First joint of outer antennæ cylindrical, and like the following. Carapax transverse.

The species for which this genus is instituted has the narrow first antennary joint of *Carcinus*; yet the posterior legs have an elliptical plate for a tarsus, and the six preceding pairs are very slender, much as in many *Amphitrite*. It is related to this last-mentioned genus; but in addition to the character of the outer antennæ, the male abdomen in our species has but four segments, the penult articulation common in other genera being here obsolete. Its form is triangular from a broad base. The prælabial plate has the usual dividing ridge. The hand is subtrigonal, but rather short, and the arm projects but little beyond the carapax. The third joint of the outer maxillipeds is about as long as broad, oblique on the outer margin and arcuate within.

The species is much broader than either those of *Carcinus*, or *Amphitrite*. The name of the genus alludes to the intermediate character between *Carcinus* and *Lupa*.

CARUPA TENUIPES.

*Carapax transversus, non areolatus, lavis, granulatus, nudus, fronte integro, medium paululo emarginato, margine antero-laterali 7-den-*



*tato, dentibus acutis, subæquis, dente 5to minimo; margine orbitali inferiore 4-lobato. Pedes antici breves, manu non armatâ, brachio anticè 3-spinoso, spinâ medianâ majore. Pedes sex proximi gracillimi, nudi, tarso longissimo. Pedes postici breviores, tarso oblongo, elliptico, apice breviter uni-spinoso.*

Carapax transverse, not areolate, smooth, granulate, nude; front entire, slightly emarginate at middle, antero-lateral margin seven-toothed, teeth acute, subequal, fifth tooth much smaller than the others; inferior orbital margin unequally four-crenate. Anterior feet short, hand without spines, arm with three spines on the anterior margin, the middle spine longest. Next six feet very slender, nude, tarsus very long. Posterior feet shorter, tarsus oblong elliptic, with a short spine at apex.

Plate 17, fig. 4 *a*, male, enlarged four diameters; *b*, under view of part of front, showing base of outer antennæ, and outline of orbit below; *c*, outer maxilliped; *d*, male abdomen; *e*, arm, under view, separated from following joints.

#### Paumotu Archipelago?

Length of carapax, two and one-fourth lines; breadth, three and a half lines; ratio of length to breadth, 1:1.5. The carapax has a short arcuate line on its surface near each posterior tooth, but is otherwise nearly smooth. The specimen may be young, yet has characters that separate it widely from other genera.

#### GENUS THALAMITA, Latreille, De Haan.

*Carapax latus, fronte longiore quam semilatitudo carapacis, margine antero-laterali longitudinali. Articulus antennæ externæ 1mus prælongus, articulo sequente orbitâ remotissimo.*

Carapax broad, front longer than half the breadth of carapax, antero-lateral margin longitudinal. First joint of outer antennæ very long, and following joint inserted far from orbit.

The old genus *Thalamita*, is divided by De Haan into *Oceanus* (for

*T. crucifera*), *Charybdis* (for *T. natator* and allied, the hexagonal species), and *Thalamita* (for the quadrilateral species). Oceanus does not, in our opinion, differ sufficiently from *Charybdis* to be sustained.

1. *Frons subinteger.*

THALAMITA ADMETE (*Herbst*).

Plate 17, fig. 5 *a*, outline of front, and of crest of base of outer antennæ, from Sandwich Islands; *b*, outer view of hand; *c*, summit of inner branch of first maxillipeds.

Sandwich Islands, Samoan Islands, and Wakes Island, Pacific Ocean; also Sooloo Sea, East Indies.

Length of carapax of a small specimen from Upolu, of the Samoan Group, six and three-fourths lines; breadth, eleven and one-fourth lines; ratio of length to breadth, 1 : 1.66. The crest of the base of the outer antennæ is evenly and short denticulate. The front is straight transverse and not arcuate. The medial region is crossed at middle by a strong line, and anteriorly either side there is a short line parallel; posteriorly another, which reaches to the posterior tooth either side. Although generally but four lateral teeth are present, a minute fifth between the third and fourth is sometimes seen.

*Cancer admetus*, HERBST, pl. 57, f. 1.

*Portunus admete*, LATREILLE, Nouv. Dict. d'Hist. Nat., xxviii. 44.

*Thalamita admete*, LATR., Reg. Anim., iv. 33; EDWARDS, Crust., i. 459.

THALAMITA INTEGRÆ.

*Carapax convexior, glaber, nitidus, regione medianâ lineis elevatis non intersectâ, fronte paulo arcuato, lobo præorbitali longo et marginem recto, et paululo elevato, margine antero-laterali 5-dentato, dentibus acutis, 4to minuto. Articulus antennæ externæ 1mus prælongus, cristâ longâ integrâ. Pedes antici breves, manu nitidâ, omnino lævi, extus non costatâ, supernè breviter 3-spinosâ (spinâ unâ in margine*



*superno ad medium insitâ, secundâ in lineâ parallelâ externâ, tertiâ juxta basin).*

Carapax much convex, smooth and shining, median region not crossed by any raised lines, front somewhat arcuate, præorbital lobe long and very low with a straight and not arcuate outline, antero-lateral margin five-toothed, teeth acute, fourth minute. First joint of outer antennæ very long, crest long and entire. Anterior feet short, hand shining, not costate on outer surface, above with three short spines—one at middle of upper edge, one on a parallel line exterior to this, and one near base.

Plate 17, fig. 6 *a*, male, enlarged two diameters; *b*, hand, *ibid.*; *c*, outer maxilliped; *d*, summit of inner branch of first maxillipeds.

Paumotu Archipelago and Sandwich Islands.

Length of carapax, seven and a half lines; breadth, one inch; ratio of length to breadth, 1:1.33. The general outline is much like that of the *Poissonii* of Audouin (Egypte, Crust., de M. Savigny, pl. 4, f. 3 and 4), and also like the figure of the *arcuatus* of De Haan (Fauna Japon., Crust., Pl. 13, fig. 1); but, unlike the former, it has only two short spines on the upper surface of the hand beside the basal one, and neither of these is at the apex of the hand. Unlike the latter, the hand is not punctate above, the præorbital tooth or lobe is longer and lower, and not arcuate in outline; the fourth lateral tooth is much smaller. At the apex of the hand there is a right angle in the margin, but no spine. The *Thalamita sima* also resembles this in outline, but the hand is strong costate without, and provided also with an apical spine. The smooth hand and carapax, and its unusual convexity, are prominent peculiarities; also the entire margin of the crest on the base of the outer antennæ.

2. *Frons multilobatus.*

THALAMITA CRENATA (*Latr.*) *Edw.*

Plate 17, fig. 7 *a*, under view, showing crest of the base of outer antennæ; *b*, summit of inner branch of first maxillipeds.

Feejee Archipelago, Pacific Ocean.

Length of carapax of a male, twelve and a half lines; breadth, eighteen and a half lines; ratio of length to breadth, 1:1.48. The crest of the base of the outer antennæ in this species is finely and evenly denticulate, the teeth being rounded granuliform. Of the six interantennary front teeth, the outer is as broad as the next adjoining; the præorbital lobe is long, and but little raised. The hand has strong costæ, and above, there are five spines, two on the upper edge, two on a costa parallel with it, and one basal, adjoining the articulation; the other costæ are without spines.

*Thalamita crenata*, EDWARDS, i. 461.

#### THALAMITA SPINIMANA.

*Carapax valde transversus, regione medianâ lineis elevatis intersectâ, margine antero-laterali æque 5-dentato, dentibus longis, acutis, curvatis, lobis frontilibus prominentibus, secundo latiore quam tertius, lobo præorbitali elongato et valde prominente. Articulus antennæ externæ 1mus prælongus, cristâ irregulariter spinulosâ. Pedes antici valde armati, carpo 6-spinoso, manu 7-9-spinosâ, (margine superno 4-5-spinoso), costis duâbus externis e spinulis obsoletis seriatis instructis.*

Carapax unusually transverse, median region crossed by raised lines, antero-lateral margin five-dentate, the teeth subequal, long, arcuate and acute; lobes of front prominent, the second broader than third, præorbital lobe elongate and very prominent. First joint of outer antennæ very long, crest irregularly spinulous. Anterior feet armed with many spines, the carpus with six spines and some spinules, the hand with seven to nine spines above (four to five of them on upper margin) and two costæ made up of series of obsolete spinules.

Plate 17, fig. 8 *a*, carapax, natural size; *b*, outside view of hand; *c*, under view showing crest of basal joint of outer antennæ.

Feejee Archipelago, Pacific Ocean.



Length of carapax of a female, one inch and seven lines; breadth, two inches and three lines; ratio of length to breadth, 1:1.6. This is a broader species than the *crenata*, with a more spinous hand. The outline of the front (by the front edge of the lobes) is quite straight and not arcuate. The penult joint of the posterior legs is spinulous below. The hands are rather slender. The arm has three or four spines on its anterior margin, the two outer large and oblong.

THALAMITA CRASSIMANA.

*Carapax valde transversus, lavis, nitidus, regione medianâ 2 lineis elevatis intersectâ; fronte recto, lobis latis, perbrevibus, truncatis, 2do latiore quam 3tio, 3tio rotundato, lobo præorbitali longo, paululo prominente, margine antero-laterali 5-dentato, dentibus acutis, 3tio non brevior, 4to brevissimo. Articulus antennæ externæ 1mus prælongus, cristâ irregulariter divisâ. Pedes antici crassi, manu paulo tumidâ supernè 5-spinosâ (margine superno spinis duabus medianis, ad apicem nullâ), extus 2-costatâ, superficie minute tuberculatâ, carpo 4-spinoso et minutè tuberculato, brachio marginem anticum 3-spinoso.*

Carapax strongly transverse, smooth, shining, median region crossed by two raised lines; front straight, lobes broad, very short, truncate, second broader than third, third rounded, præorbital lobe long, little prominent, antero-lateral margin five-toothed, teeth acute, third not shorter than second, fourth very short. First joint of outer antennæ very long, crest irregularly divided. Anterior feet stout, hand somewhat tumid, above with five spines (two median spines on upper margin and no apical), on outer surface two ribs, surface minutely tuberculate, carpus with four spines and minutely tuberculate, anterior margin of arm with three spines.

Plate 17, fig. 9 *a*, male, natural size; *b*, under view of part of front, showing crest of base of antennæ; *c*, outer view of hand; *d*, summit of inner branch of first maxillipeds.

Length of carapax, one inch and seven lines; breadth, two inches and three lines; ratio of length to breadth, 1:1.6. The species appears to be the *Thalamita prymna* as figured by De Haan (Pl. 12,

f. 2), but according to Edwards (Crust., i. 461), that species, besides having the fourth lateral tooth rudimentary, has the third tooth but little salient; while in our species the latter is quite as prominent as the second, and these two are the largest; also, the external frontal teeth are pointed and small, while they are rounded or subtruncate in the *crassimana*. It is also near the *Thalamita cœruleipes* of Hombron and Jacquinot (Crust., Voy. au Pole Sud, Pl. 5, f. 6), but that has the fourth lateral tooth much larger than in the above, although still a little shorter than the rest, and the peduncle of the eye is set around with short spines or processes, while in the above, there are no projecting points; the hand also is much less stout. The small tubercles of the hand are scattered over the upper and lateral surface, as far down as the first costa. The under and lower half of inner surface of the hand is smooth. The posterior natatory legs are smaller than usual in this genus.

## GENUS CHARYBDIS.

*Carapax angustior.* *Frons dimidio latitudinis brevior, et margo antero-lateralis obliquus. Articulus antennæ externæ 1mus minus oblongus, articulo sequente a hiatu orbitæ paulum remoto.*

Carapax narrower than in *Thalamita*. Front shorter than half the breadth of carapax, and antero-lateral margin oblique. First joint of outer antennæ less oblong, and the following joint much less distant from the orbit.

## CHARYBDIS ORIENTALIS.

*Carapax lævis, regione medianâ 2-3-lineis elevatis intersectâ, fronte arcuato, dentibus valde obtusis, 3tio triangulato, margine antero-laterali 6-dentato, dentibus acutis, 2do minimo, postremo non longiore.*

Carapax smooth, median region crossed by two or three raised lines, front arcuate, teeth very obtuse, third triangular, antero-lateral margin six-toothed, teeth acute, second very small, last not longer than others.

Plate 17, fig. 10, carapax, natural size.



Caldera, Island of Mindanao, Philippines.

Length of carapax, one inch three and one-fourth lines; breadth, one inch and ten lines; ratio of length to breadth, 1:1.5. The præ-orbital lobe is hardly broader than the second frontal lobe. The crest of the basal joint of the outer antennæ is short, rounded, entire, or nearly so. The second tooth of the antero-lateral margin is a part properly of the first tooth, a part cut from its posterior side. This species differs from the *C. anisodon*, De H. (F. Jap., 42), in not having the posterior of the lateral teeth larger than the others.

#### CHARYBDIS CRUCIFERA.

Plate 17, fig. 11 *a*, outline of carapax of a young individual, natural size; *b*, hand of same; *c*, summit of inner branch of first pair of maxillipeds.

Singapore, East Indies.

Length of the carapax of a male, two inches two and a half lines; breadth, three inches two and a half lines; ratio, 1:1.46. In the specimen supposed to be young of the *crucifera*, the carapax is short pubescent, and the last tooth is half longer than the others. The proportions are the same as in the large specimens, the length of the carapax being thirteen lines; breadth between tips of posterior teeth, nineteen lines; ratio of length to this breadth, 1:1.46; breadth between tips of next teeth anterior, seventeen and a half lines; ratio of length to this breadth, 1:1.35.

*Portunus crucifer*, FABR., Suppl., 364.

*Thalamita crucifera*, EDWARDS, Crust., i. 462.

*Oceanus crucifer*, DE HAAN, Crust., Faun. Japon., 40.

#### CHARYBDIS AFFINIS, Dana.

Plate 17, fig. 12 *a*, front, natural size; *b*, outer view of larger hand; *c*, part of inner branch of first maxillipeds.

Singapore.

The specimens here referred to, have the posterior lateral tooth nearly twice as long as either of the others, and directed outward, while the others point forward. There are six teeth in all, the anterior notched at top, or subtruncate. The medial region is crossed by two raised lines, rather strongly drawn, the hinder reaching to the posterior lateral teeth. The surface of the carapax has a very short downy coating. The hand has five spines above, two on the upper margin (one of them apical), and three parallel on an outer line. The arm has three spines on its anterior margin. The teeth of the front are somewhat triangular, but hardly acute. The hand has two costæ across the medial portion of the outer surface, besides a lower one running into the immoveable finger. The left hand is the largest in our specimens. The emargination in the under orbital margin is very narrow. There are three spines on the anterior margin of the arm, but the inner one is quite small, much less than half the size of the next. Length of carapax of a male, eleven and a half lines; breadth, between tips of larger teeth, seventeen and three-fourths lines; ratio of length to this breadth, 1 : 1.54; between tips of next anterior, sixteen lines; ratio of length to this breadth, 1 : 1.4.

The species pertains to that division of the genus having the posterior tooth larger than the others; it is unlike the *variegatus*, Fabr., (De H.), and the *anisodon*, De H., in the hand having five spines above, and unlike the *callianassa*, Edw., as the hand is not "hérissées d'épines courtes."

## CHARYBDIS —————?

Plate 17, fig. 13 represents a young individual of a species of *Charybdis*, which we hesitate to characterize from the single specimen. The sketch is enlarged four diameters. The front is strongly arcuate and entire, excepting the median emargination. The antero-lateral margin has five nearly equal teeth. The first basal joint of the outer antennæ is short, and the next joint is articulated with it quite near the orbit, though separated from it by a thin process; there is a thin ridge or crest upon the first joint, just beneath the second. The surface of the carapax is naked and granulous. The legs of the second, third, and fourth pairs are long and very slender. Length of carapax, ten and a half lines; breadth, thirteen and a half lines; ratio of length to breadth, 1 : 1.3.



GENUS LISSOCARCINUS, *White.*

*Carapax suborbicularis, fronte utraque margine antero-laterali simul arcuatis, fronte producto, sive integro sive medium emarginato. Articulus antennæ externæ unus fere longitudinalis, hiatus orbitæ occupans, processu angusto articulum sequentem e orbitâ præcludente. Pedes nudi, antici breves, brachio ultra carapacem vix saliente, manu perbrevis.*

*Carapax suborbicular*, the front and either antero-lateral margin forming an arcuate outline, front produced, either entire or emarginate at middle. Feet nude, anterior short, arm hardly projecting beyond the carapax, or not at all so, hand very short. First joint of outer antennæ nearly longitudinal, filling the orbital hiatus, a narrow process separating the following joint from the orbit.

We have modified the generic characters of this genus, established by Adams and White, in order that it may include our species, which is evidently closely related to the *L. polybioides*.

The carapax is smooth and has a hard-looking surface, and the shell of the legs is equally thick and shining. The very short arm and hand, as well as the character of the front, distinguish it from any of the *Charybdes*. The lateral margin is thin and a little reflexed. The part of the hand posterior to the fingers is not longer than its vertical height; and it has not the costate appearance of most of the *Thalamitæ*. Moreover the species are very narrow, the following but little broader than its length, and the *polybioides* even narrower than long.

The third joint of the outer maxillipeds is transverse in the *polybioides*, but a little oblong in the *orbicularis*. The only marking on the surface of the carapax in each is a straight line extending inward from the posterior lateral lobe or tooth.

*Lissocarcinus*, WHITE, Samarang Crust., p. 45.

## LISSOCARCINUS ORBICULARIS.

*Carapax paululo latior quam longus, lævissimus, nitidus, fronte medium*

*parce angulato, integro, margine antero-laterali tenui, paulo reflexo, obsolete 5-lobato. Pedes antici perbreves, manu supernè bicarinatâ, carinis integris, digito mobili supra bene carinato. Pedes 8 postici nudi, articulo tertio superne obtuso, tarso pedis postici angustè subovato, apicem acuto et inflexo.*

Carapax slightly broader than long, very smooth and shining, front having a slight angle at middle, entire, antero-lateral margin thin, a little reflexed, obsoletely five-lobed. Anterior feet very short, hand bicarinate above, carinæ entire, moveable finger with a thin acute carina. Eight posterior feet nude, third joint obtuse above, tarsus of posterior pair narrow subovate, acute at apex and the point bent one side.

Plate 18, fig. 1 *a*, male, enlarged two diameters; *b*, under view of front; *c*, hand; *d*, summit of inner branch of first maxillipeds; *e*, male abdomen.

Coral reefs of Ovalau, Feejee Archipelago.

Length of carapax of male, five lines; breadth, five and a half lines; ratio of length to breadth, 1 : 1.1. The antero-lateral margin appears entire unless closely examined, when slight fissures are observed cutting the margin into lobes. The hand has a flat top between the two carinæ, and the outer surface, although not costate, is angled along two longitudinal lines. The eyes when thrown back are wholly concealed in the orbits. The medial sternal suture extends very nearly to the third transverse suture, counting from behind. The form of the sternum is orbiculato-cordate.

#### SUBFAMILY II. ARENÆINÆ.

##### GENUS ARENÆUS.

*Lupa antennis externis, formâ carapacis, manu prismaticâ affinis. Palatum colliculo utrinque non subdivisum.*

Outer antennæ, form of carapax, and prismatic hand, same as in *Lupa*. Palate not divided either side by a longitudinal ridge.



ARENÆUS CRIBRARIUS, (*Lamk.*) *Dana.*

Plate 18, fig. 2 *a*, under view of mouth, the outer pairs of organs removed—showing, *e*, the anterior margin of the buccal area—*mx*, the summit of the inner branch of the first maxillipeds—*md*, the mandibles without the mandibular palpi; *b*, one of the outer maxillipeds.

Rio Janeiro, Brazil.

Length of carapax, one inch seven and a half lines; breadth between tips of long lateral spines, three inches and six lines; ratio of length to this breadth, 1:2.15; breadth between the teeth next anterior, two inches ten and one-fourth lines; ratio of length to this breadth, 1:1.76.

The habits of this species are different somewhat from the true *Lupas*, the individuals being found along the sandy beaches, about the harbour of Rio,—a peculiarity to which the name of the genus alludes. The colour of the carapax, to which the specific name refers, has a reticulated arrangement, there being a fine network of a purplish slate-colour on a pale yellowish ground; on the arm and hand the areolation is larger. The two teeth of the front either side of the middle are smaller and are united so as to form a doubly-pointed tooth, the inner point a little the longer. The arm is rather short, and has three spines on its anterior margin.

*Portunus cribrarius*, LAMARCK, v. 259.

*Lupa cribraria*, EDWARDS, i. 452.

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FAMILY V. PLATYONYCHIDÆ.

*Palatum lineâ elevatâ utrinque non subdivisum. Ramus maxillipedis  
lmi internus simplex. Carapax angustus. Abdomen maris basi  
angustum.*

Prælabial space or palate not divided on either side by a ridge. Inner branch of first maxillipeds simple. Carapax narrow. Male abdomen narrow at base.

The following are the genera of this family with their characteristics :—

I. *CARCINUS*, *Leach*.—Pedes postici male natatorii, tarso perangustolanceolato.

II. *PORTUMNUS*, *Leach*.—Pedes 5ti natatorii tantum, tarso latiore, lanceolato, acuto. Carapax non latior quam longus.

III. *PLATYONYCHUS*, *Latr*.—Pedes 5ti natatorii tantum, tarso lato, elliptico. Carapax latior quam longus.

IV. *POLYBIUS*, *Leach*.—Pedes 8 postici natatorii, tarsis latè lanceolatis.

The genus *Xaiva* of M'LEAY (Smith's *Illust. Zool. S. Africa*, pl. 3), is described as near *Carcinus*, the only distinguishing character mentioned being, that the third joint of the outer maxillipeds is subquadrate, carinate at base, and the inner margin is emarginated just above its middle, where the next joint arises. This form of the joint occurs in *Platyonychus*. The outer antennæ are inserted, as in *Carcinus*, in a fissure of the orbital margin, and the first joint is short and subtriangular.

#### PLATYONYCHUS PURPUREUS.

*P. bipustulato affinis. Carapax paulo transversus (latitudine quartâ parte majore); margine antero-laterali brevior, crassè 5-dentato; fronte 4-dentato, dentibus acutis, inter sese non æque remotis, medianis propioribus. Pedes antici fere æqui, carpo granulis minutis reticulato et scabriculo, intus elongatè acuto, manu granulis asperatâ, infernè transversim plicatâ. Pedes postici margines densè ciliati, articulo tertio supernè non denticulato, tarso fere duplo longiore quam lato. Abdomen maris fere lineare, segmento penultimo basin non latiore.*

Near *P. bipustulatus*. Carapax transverse (breadth one-fourth greater than length); antero-lateral margin shorter than postero-lateral, coarsely five-toothed; front four-toothed, teeth acute, the two me-



dian nearer than either median and the lateral. Anterior feet nearly equal, carpus reticulate, rough with minute granules, long acute within; hand rough with granules, below transverse plicate. Posterior feet having the margins of the joints dense ciliate, third joint not denticulate above, tarsus nearly twice longer than broad. Male abdomen nearly linear, penult segment not broader at base.

Plate 18, fig. 3, animal, natural size.

Length of carapax of a male, two inches and six lines; breadth, three inches and four lines; ratio of length to breadth, 1:1.33. Colour purple, in fine close dottings over the surface, becoming deep purple along the posterior of the median region, which is convex posteriorly and sublunate in outline; posterior to this for some distance yellowish, and also yellowish near the antero-lateral margin. Carpus reticulate with purple above. Other legs in part purple or reddish purple; tarsus of last pair having a middle of pale blue, a narrow border of purple, and the marginal hairs yellow and penult joint similar. The tarsus of the second pair of legs is broad lunate falciform, with a triangular channel in the dorsal margin.

In the male specimens of those in the collections, whose dimensions are given above, the third joint of the second pair of legs has its upper apical margin produced upward and cartilaginous at summit. In a smaller female, two and a quarter inches long, this part is much less prominent, and resembles the shell in its other part.

The species is near the *punctatus* of De Haan (F. Jap., p. 44, pl. 1, f. 2); but the two median teeth of the front are much nearer together and farther from the lateral, the male abdomen is more linear, the penult joint being no wider at base than at apex. The colour is yellow in the *punctatus*.

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## II. TELPHUSINEA, OR CANCROIDEA GRAPSIDICA.

THIS section includes, besides the recognised species, the genus *Orthostoma* of Dr. J. W. Randall (Proc. Acad. Nat. Sci. Philad., viii.

121). It was placed near *Gecarcinus* by Dr. Randall; but the insertion of the male verges is in the bases of the posterior legs and not in the sternum. It has the fourth joint of the outer maxillipeds articulated with the outer apex of the third, as in *Trichodactylus*. But the general form of the body is much more convex, and the third joint of these maxillipeds is narrow oblong, and but slightly shorter than the second. The antero-lateral margin of the carapax is denticulate. The texture of the shell resembles that of the other *Telphusidæ*. The male abdomen is quite broad triangular. The palate is not divided by two longitudinal ridges as in the other *Telphusineæ*, and it is probable that the *Orthostomata* should constitute a distinct family. These ridges are, however, rather indistinct in some *Telphusæ*. The *Orthostomata* appear to form a transition between the *Telphusidæ* and the *Gecarcinidæ*; there is a resemblance to the latter in general form, as well as in the absence of these ridges.

The genus *GALENE* arranged with the *Eriphidæ*, has close relations to this group.

Many Crustacea of this family were collected; but, the unfortunate loss of the Peacock was the loss of all the specimens, excepting a *Trichodactylus*.

From the occurrence of the species of *Telphusineæ* mostly in fresh waters, they are properly called the *Cancroidea Fluviatrica*, while the other species already described are the *Cancroidea Marina*. The peculiarity in the branchial cavity is connected with this peculiarity in their habits.

- G. 1. *TELPHUSA*, *Latr.*—Articulus maxillipedis externi 3tius subquadratus, 2do multo brevior, 4tum angulo apicali interno gerens.
- G. 2. *VALDIVIA*, *White.*—Articulus maxillipedis externi 3tius oblongus, 2dus transversus. [Carapax margine antero-laterali 4-dentatus.] Pedes longi.
- G. 3. *POTAMIA*, *Latr.*—Articulus maxillipedis externi 3tius subquadratus, apice subtriangulatus anguloque apicali 4tum gerens.
- G. 4. *TRICHODACTYLUS*, *Latr.*—Carapax marginibus subinteger. Articulus maxillipedis externi 2dus oblongus, 3tius vix oblongus, subtriangulatus, margine terminali valde obliquo anguloque externo 4tum gerens, 2do multo brevior.
- G. 5. *ORTHOSTOMA*, *Randall.*—Carapax margine antero-laterali dentatus. Articulus maxillipedis externi 2dus oblongus, 3tius oblongus, 2do paulo brevior, apice obliquus, prope angulum anteriorem articulum 4tum gerens.



## GENUS TRICHODACTYLUS.

TRICHODACTYLUS PUNCTATUS (?), *Eydoux and Souleyet*.

*T. quadrato affinis. Punctatus. Margo carapacis antero-lateralis minutè bi-emarginatus, non reflexus. Frons leviter excavatus. Digiti plerumque brevissimè tomentosi, eoque tarsi similes. Articulus maxillipedis externi 3tius 2do vix brevior.*

Near *T. quadratus*. Punctate. Antero-lateral margin of carapax minutely bi-emarginate, not reflexed. Front slightly excavate. Fingers mostly tomentose like the tarsi. Third joint of outer maxillipeds but little shorter than second.

Rio Janeiro.

Length of carapax, thirteen lines; greatest breadth, fifteen lines; ratio of length to breadth, 1:1.15. This species may be the *quadratus*; but that species, according to the figure in Edwards's Cuvier, Plate 15, represents the margin entire. The punctate character is a peculiarity also of the *quadratus*.

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 III. CYCLINEA.

*Pedes postici non natatorii. Antennæ externæ obsoletæ. Ramus maxillipedis 1mi internus simplex. Carapax angustus vel suborbicularis.*

Not natatory. Outer antennæ obsolete. Inner branch of first maxillipeds simple. Carapax narrow or suborbicular.

The singular species here included, has much the appearance of an *Atelecyclus*, and its relation to that group is suggested by Lucas.

The buccal area is well closed by the outer maxillipeds, as is usual in the Cancridæ, the orbit is not open on the outer inferior side as in *Atelecyclus*, the abdomen (narrow in the males, broad in the females), is that of the Cancridæ, and excepting the form and the absence of the moveable part of the outer antennæ, we should at once recognise them as pertaining to that group. The buccal area is a little narrower anteriorly, but this is not sufficient (as it is not connected with an adaptation of the inner branch of the first maxillipeds to the formation of a tube for the efferent canal), to prove any relation to the true *Oxystomes*. *Acanthocyclus* has the inner antennæ unfolding from a longitudinal fissure in the front margin, as in *Plagusia*; and the form, appearance, and habit, are much as in the thicker *Plagusiæ*. The articulation of the fourth joint of the outer maxillipeds with the inner apex of the third, is also a characteristic of *Plagusia*. But the narrow sternum behind, and the position of the male verges, exclude the species from any intimate relation with that group; still it exemplifies, not only a passage from the Cancridæ to *Atelecyclus*, but also to *Plagusiæ*.

In *Acanthocyclus*, the front margin of the prælabial area is rather narrow, and has two deep emarginations (somewhat as in *Eriphia*) as the aperture of the efferent canal, but the palate is without ridges.

The only known genus referable to this group is *Acanthocyclus*. *Cymo* has the same orbicular outline, but has the outer antennæ complete. The number of branchiæ forming the exterior of the branchial pyramid in *Acanthocyclus*, is but five, and in this respect also, the species approach the *Plagusiæ*.

#### ACANTHOCYCLUS GAYI, *Lucas*.

Plate 18, fig. 4 *a*, outer or third maxilliped, enlarged; *b*, second maxilliped; *c*, part of first maxilliped.

Valparaiso, Chili.

Length of the carapax of a male, nine and three-fourths lines; breadth, ten lines. The carapax is pubescent, especially towards the front and antero-lateral margins. The male abdomen is very nearly naked, though in parts very short tomentose. The under surface of



the hand is also naked. The front between the inner antennæ is small, triangular, and pointed, and this point rather seems to arise from the spine of the interantennary septum, the front bending down somewhat, so as to meet it and coalesce with it; as seen from below, the under side passes horizontally inward to the space between the antennæ. The tarsus is conical and smooth, but very much incurved, and it is naked, except a short tomentose covering at base.

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### III. CRUSTACEA CORYSTOIDEA.

THE Corystoidea resemble the Cancroidea in the character of the mouth and the efferent channel, and are represented in the latter group by the Cancrinæ and Platyonychidæ. The extension of the outer maxillipeds over the epistome is common to most of the species of these three groups; but the true Corystoidea are readily distinguished by the outer antennæ, which are more or less elongated and hairy; and with few exceptions they bend inward and forward.

Part of the species of this group have the transverse, non-rostrate form of the Cancroids, with sometimes the outer maxillipeds fitting neatly to the epistome; but these pass into others that are elongate, and approximate in many characters to the Hippidea. In attempting to arrange the genera in natural groups, this relation of the species to the higher and lower orders should be observed. We thus distinguish three families: the *first*, in which the carapax is transverse and non-rostrate, the outer maxillipeds fitted neatly to the anterior margin of the buccal area, the outer antennæ short and subpilose; the *second*, having the carapax suborbicular and non-rostrate, the outer maxillipeds projecting over the epistome, in Corystoid style, the outer antennæ short and subpilose; the *third*, having the carapax orbicular or oblong, and rostrate, the outer maxillipeds projecting over the epistome, the outer antennæ elongated and pilose. These families, and the genera they contain, are as follows:

## FAM. I. TRICHOCERIDÆ.

Carapax formâ Cancroideus, fronte non rostratus. Antennæ internæ longitudinales. Antennæ externæ breves, flagello parce piloso. Maxillipedes externi super epistoma non producti, sed margini areae buccalis bene adaptati.

G. TRICHOCERA, *De Haan*.\*—Frons dentatus. Articulus maxillipedis externi 3tius apice truncatus. Articulus antennarum externarum 1mus elongatus, hiatum orbitæ bene occupans.

## FAM. II. THIIDÆ.

Carapax suborbicularis, non oblongus, fronte non rostratus. Antennæ internæ transversæ vel obliquæ. Antennæ externæ breves, flagello parce piloso. Maxillipedes externi super epistoma producti.

G. 1. THIA, *Leach*.—Frons integer, arcuatus. Antennæ internæ transversæ. Pedes nulli natatorii. Articulus maxillipedis externi 3tius vix oblongus.

G. 2. KRAUSSIA, *Dana*.—Carapax paulo transversus, margine postero-laterali brevi, fronte denticulato, medio emarginato. Antennæ internæ obliquæ. Pedes 8 postici natatorii, tarso falciformi. Articulus maxillipedis externi 3tius vix oblongus.

## FAM. III. CORYSTIDÆ.

Carapax sive suborbicularis sive multum angustus, fronte plus minusve rostrato. Maxillipedes externi super epistoma producti.

1. *Pedes nulli natatorii.*

G. 1. TELMESSUS, *White*.†—Carapax parce transversus, pone medium latior, fronte paulo producto et medio emarginato. Articulus antennarum externarum 1mus elongatus, processu elongato hiatum orbitæ bene occupans. Articulus maxillipedis externi 3tius parce oblongus apice triangulatus, articulum 4tum prope apicem gerens.

G. 2. ATELECYCLUS, *Leach*.‡—Carapax fere orbicularis, lateraliter arcuatus, fronte

\* Faun. Japon. (1833), p. 16.

† A. White, Ann. Mag. Nat. Hist., xvii. 497, 1846; Voy. Samarang, 14, tab. 3.

‡ *Chlorodius*, De Haan, Faun. Japon., 13.



- paulo producto. Articulus antennarum externarum 1mus elongatus hiatum bene occupans. Articulus maxillipedis externi 3tius oblongus, apice oblique truncatus, in marginis interni emarginatione articulum 4tum gerens.
- G. 3. PELTARION, *Hombron et Jacquinot*.\*—Carapax suborbicularis, ante medium latior, fronte triangulatè rostrato. Articulus antennæ externæ 1mus perbrevis, 2do parce crassior. Articulus maxillipedis externi 3tius non oblongus, apice truncatus. Articulus pedum 8 posticorum 5tus 4to vix brevior.
- G. 4. PSEUDOCORYSTES, *Edwards*.—Carapax suborbicularis, parce oblongus, triangulatè rostratus. Articulus maxillipedis externi 3tius vix oblongus. Articulus pedum 8 posticorum 5tus 4to duplo brevior.
- G. 5. GOMEZA, *Gray*.†—Carapax oblongus, fere ellipticus, triangulatè rostratus. Oculi parvi vel mediocres. Articulus maxillipedis externi 3tius vix oblongus vel transversus, apice truncatus. Articuli pedum 8 posticorum 4tus et 5tus fere æqui.
- G. 6. OEÏDIA, *De Haan* (partim).‡—Carapax oblongus, antice non angustans, fronte breviter rostrato. Oculi permagni. Articulus maxillipedis externi 3tius latus, oblongus, 2do paulo brevior. Articuli pedum 8 posticorum 5tus et 4tus fere æqui.
- G. 7. CORYSTES, *Jatzeille*.—Carapax oblongus, rostratus. Oculi mediocres. Articulus maxillipedis externi 3tius angustè oblongus, 2do vix brevior.

#### 2. *Pedes postici natatorii*.

- G. 8. DICERA, *De Haan*.§—Carapax oblongus, rostro late triangulato. Pedes postici natatorii, tarso falciformi. Articulus maxillipedis externi 3tius angustè oblongus, 2do parce brevior.

The areolation of the carapax in the Corystoidea, where distinct, is Cancroid in character, yet with some peculiarities in the more typical species. The medial region is much elongated behind, this elongation occurring mainly in the intramedial areolet (3 M), which in its posterior part, is about as long as broad or even oblong, reaching two-thirds of the distance to the posterior margin of the carapax. Consequently the cardiac areolet is placed far back of the middle in the posterior third of the body. The five teeth or lobes D, E, N, T, S, may be distinctly counted in some species, as in Peltarion and Gomeza (Plate 18), as explained more particularly beyond; and in these and similar cases, the antero-lateral margin extends far back

\* Hombron et Jacquinot, *Voy. au Pole Sud*, tab. 8, f. 1.

† *Oeidia*, De Haan in part, *Faun. Japon.*, 15. The typical species of *Oeidia* (*O. 20-spinosa*) is a true Gomeza, as recognised by Gray.

‡ *Faun. Japon.*, 15, 45. Species *Oeidia distincta*, De Haan, is the type of the genus as received. *Jonas*, Hombron et Jacquinot, *Voy. au Pole Sud*, tab. 8, f. 4-8.

§ *Faun. Japon.*, 14 (1833). *Nautilocorystes*, Edwards, *Crust.*, ii. 149 (1837).

of the middle of the carapax, and the antero-lateral regions constitute about three-fourths of the whole surface. In other species, however, as of *Corystes* and *Dicera*, the antero-lateral margin appears to be very short, although as to the regions of the surface nearly as above described; but this point requires fuller investigation.

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FAMILY I. TRICHOCERIDÆ.

GENUS TRICHOCERA, *De Haan*.

TRICHOCERA OREGONENSIS.

*Carapax transversus, convexus, gibbosus, granulosus, anticè lateraliterque bene arcuatus, angulo laterali vix instructus, margine laterali (postero-laterali incluso) dentato, 13 dentibus, regularibus, brevibus; margine postero-laterali recto; fronte inter-antennali brevi, recto, medium non emarginato. Pedes antici crassi, manu perbrevis, altâ, supernè minutè tuberculatâ, extus lævi et obsolete 5-costatâ. Pedes 8 postici pubescentes.*

Carapax transverse, convex, gibbous, granulous anteriorly, either side arcuate, and hardly having an angle on the lateral margin, this whole margin (including the postero-lateral), dentate with thirteen short, regular teeth, postero-lateral margin straight; inter-antennary front short, straight, not emarginate at middle. Anterior feet stout, hand very short, high, minutely tuberculate above, outer surface smooth, and having five exceedingly slender costæ. Eight posterior feet pubescent.

Plate 18, fig. 5 *a*, animal, natural size; *b*, under view of part of front; *c*, outer or third pair of maxillipeds; *d*, second maxillipeds; *e*, first maxillipeds; *f*, outer view of hand; *g*, tarsus.

Puget's Sound, western coast of North America.—C. Pickering.



Length of carapax, eight and a half lines; breadth, eleven lines; ratio of length to breadth, 1:1.3. The front has a very slight trace of an emargination either side of the middle, although none at middle, and with this exception is entire; it does not project at all forward of the line of the orbits. The medial region is somewhat prominent, the areolets 2M and 3M being distinct, so also the cardiac, and several of the antero-lateral areolets, although none are very well defined. The surface of the carapax is granulous, especially about the upper part of the areolets and along the margins. The antero-lateral teeth are alternately acute, or appear to have a spiniform termination. These alternate, acute teeth are the first, third, fifth, seventh, ninth, and they correspond to the normal teeth, D, E, N, T, S; the first four normal teeth being double, make up the number *nine*. The outer antennæ are nearly half as long as the carapax, the basal joint of this pair is quite broad and prominent, somewhat above the orbit.

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## FAMILY II. THIIDÆ.

### GENUS KRAUSSIA, Dana.

*Thiæ affinis.* Carapax transversim crenulato-lineolatis, fere orbiculatus, margine antero-laterali multo longiore quam postero-lateralis, dentato aut denticulato. Pedes antici mediocres, digitis instar cochlearis excavatis. Pedes 8 postici tarso ensiformi confecti. Articulus maxillipedis externi 3tius parvulus, articulum proximum angulo interno excavato ferens. Antennæ internæ valde obliquæ, externæ breves, fere nudæ.

Near *Thia*. Carapax transversely crenulato-lineolate, nearly orbicular, antero-lateral margin much longer than postero-lateral, dentate or denticulate. Anterior feet of moderate size, finger spoon-like at extremity. Eight posterior feet with an ensiform tarsus. Third joint of outer maxillipeds small, bearing next joint at inner

angle, which is excavate. Inner antennæ very oblique; outer short and nearly naked.

The genus *Kraussia* is instituted for a species figured by Krauss, in his work on South African Crustacea, as a *Platyonychus*\* (*De Haan*, *Portumnus* of Leach); and for another described and figured by De Haan as a *Xantho*.† It is very far removed from *Xantho*, and not remote in its relations from *Portumnus*. Yet it appears to be more closely like the *Corystoidea*, especially *Thia*, and we therefore arrange it in this group. It differs widely, in fact, from *Portumnus* and the related genus *Platyonychus*, in having the postero-lateral margin much shorter than the antero-lateral, in being a little wider than long, in having the front two-lobed and denticulate, and in the outer antennæ not being as naked, although less hairy and shorter than in most other *Corystoid* species, a peculiarity in which it is near *Trichocera*. Moreover, the surface in one of the species, if not both, is marked transversely by interrupted, obsolescent lines, having a crenulate margin, as in the *Hippidea*, and some other *Anomoura*.

The abdomen in both sexes is short and narrow; in the male five-jointed, in females seven-jointed. The tarsi of all the eight posterior legs are thin ensiform. The buccal area is somewhat oblong, a little narrower behind. Orbit with two indentations in the margin above. Internal orbital fissure filled or nearly so, by the first joint of the outer antennæ. Eyes of moderate size. In our specimen, the tarsus of the second, third, and fourth pairs of legs is a thin blade, concave in outline above, with the back thin except a small broad triangle at base, which is concave in its surface, and the penult joint is flattened above with the anterior of the upper margins subcristate. The tarsus of the fifth pair is a similar blade, but with a broad concave back reaching to its tip. The inner antennæ make an angle of about sixty degrees with one another, and are but imperfectly retracted into fossettes, the fossettes being very shallow.

The *Trichocera porcellana* of A. White (*Voy. Samarang, Crust.*, p. 69), appears to be a *Kraussia*; and is possibly identical with Krauss's species.

\* *Platyonychus rugulosus*, KRAUSS, page 26, Plate 1, fig. 5.

† *Xantho integer*, DE HAAN, *Fann. Japon.*, p. 66, Pl. 18, fig. 6.



KRAUSSIA RUGULOSA (*Krauss*), *Dana*.

*Carapax fere orbiculatus, parce transversus, fronte inter-antennali bilobato, lobis parce excavatis, 9-10-denticulatis et elongato-ciliatis; margine antero-laterali remotè 5-denticulatis denticulis spiniformibus et inter denticulos denticulis aliis minutis, paulo ciliatis, superficie carapacis inconspicuè areolatâ, lineis transversis interruptis crenulatis notatâ. Manus extus partim subtiliter crenulato-lineolata, digito superiore tribus costis crenulatis supernè notato, unâ interiore obsolescente.*

Carapax nearly orbicular, sparingly transverse, front between the antennæ bilobate, the lobes slightly excavate, and about nine-toothed, long ciliate; antero-lateral margin remotely five-toothed, and between these teeth other minute teeth, also somewhat ciliate; surface of carapax indistinctly areolate, but marked with interrupted transverse crenulate lines. Hand in part crenulato-lineolate, upper finger having above three longitudinal crenulate ridges, the inner one obsolescent.

Plate 19, fig. 1 *a*, female, enlarged two diameters; *b*, enlarged view of front; *c*, outer maxilliped; *d*, hand, enlarged three diameters; *e*, tarsus of third pair, enlarged; *f*, abdomen of female, enlarged.

Sandwich Islands, island of Maui.

The specimen described is a female. Length of carapax, five and a half lines; breadth, six and a half lines. The carapax shows faint indications of the median areolet. The ciliation of the front is quite as long as the front margin of either lobe; the ciliæ are easily broken off, and were probably mutilated in Krauss's specimen, as they are not mentioned by him, nor represented in his figure. The lateral margin is furnished with some hairs, and besides there are a few on the surface near this margin. The posterior legs are rather stout, the joints broader for the length than in the figure of the South African species by Krauss. The third joint of the fifth pair is hardly twice as long as its breadth. The fourth joint of the outer maxillipeds is furnished with very long hairs on the anterior margin, two or three times as

long as the joint, while they are half as long as the joint in Krauss's figure. The apex of the peduncle of the eye has two or three minute spinules or points. The penult joint of the female abdomen is nearly rectangular and rather longer than broad, each joint excepting the first and last has two tufts of long hairs, those of the second joint are in part reversed, and as long as the first and second joints together. The sternum is very narrow. The orbit has an emargination at its outer angle, and on the upper side of the peduncle of the eye adjoining the cornea there is a short spine, less acute and shorter than in Krauss's figure.

*Platyonychus rugulosus*, KRAUSS, Südaf. Crust., p. 26, Pl. 1, f. 5.

*Trichocera porcellana?* A. WHITE, Voy. Samarang, p. 59.

GENUS TELMESSUS, *White*.

TELMESSUS SERRATUS, *White*.

Plate 18, fig. 8 *a, b, c*.

Puget's Sound. *C. Pickering*.

The form of this species is very closely as represented in White's figure (Crust., Voy. Samarang, Pl. 3). The front between the eyes projects and is three-lobed, the two outer lobes triangular and subacute, the inner a little more prominent, and with four small dentations at apex. The dorsal view on the Plate referred to, appears to represent the middle lobe of the front as in our specimen, but not so the under view (fig. *a*, of White). The outer antennæ project either side of the median lobe. The antero-lateral margin is coarsely four-dentate; teeth triangular and partly with spinulous margins; posterior tooth (S) largest. The line between the teeth crosses the carapax much behind the middle of the carapax, the anterior and posterior part having nearly the proportions in length of 8 to 5. The breadth along the line between these teeth in one specimen is seventeen lines, and length of carapax, fourteen lines. The postero-lateral margin has two prominent teeth, the posterior of the two much the smaller.

The position and size of the base of the outer antennæ, as well as the short epistome and general form, lead us to believe that the



species pertains properly with the Corystoidea, and not with the Maiioidea, where it is placed by White.

*Telmessus serratus*, WHITE, Ann. and Mag. Nat. Hist., 1846, xvii. 497, and Crust., Voy. of the Samarang, p. 14, Pl. 3.

### FAMILY III. CORYSTIDÆ.

*PELTARION SPINULOSUM* (*White*), *Hombron and Jacquinot*.

Plate 18, fig. 6 *a*, animal, natural size; *b*, abdomen of male.

From Southern Patagonia.

Length of carapax of a male to tip of beak, two inches; breadth, also two inches. Finely reticulated with a reddish-orange colour, legs yellow, or orange. The regions in this species may be distinguished, although not very apparent. The medial is a little raised, and the intra-medial (3 M), is distinct from the extra-medial (2 M); this intra-medial is prolonged somewhat backward and has a linear scar either side of it, and from near the posterior part of this scar a depression commences which passes obliquely towards the margin, reaching it between two of the prominent points of the lateral margin,—the median one of the lateral margin and the next posterior. This depression is the limit between the antero-lateral and postero-lateral regions, and the posterior of the points on the margin is therefore S; anterior to it there are four prominences, corresponding to T, N, E, D, making the normal number five, each of which lobes is set with spinules.

*Atelecyclus spinulosus*, A. WHITE, Ann. Mag. N. H., xii. 345.

*Peltarion magellanicus*, H. and JACQ., Voy. au Pole Sud, pl. 8, f. 1.

*PSEUDOCORYSTES SICARIUS* (*Pœppig*), *White*.

Valparaiso, Chili.

Length of carapax, one inch and eleven lines; breadth, one inch and ten lines; ratio of length to breadth, 1 : 0.99.

*Corystes sicarius*, PEPPIG, Wieg. Arch., 1836, 139.

*Pseudocorystes armatus*, EDWARDS, Crust., ii. 151; LUCAS, D'Orb. S. A. Crust., p. 30, pl. 15, f. 2.

*Pseudocorystes sicarius*, A. WHITE, Catalogue of Crust., Brit. Mus., 1847, 53.

## GOMEZA SERRATA.

*Carapax subovatus, scabrosus, breviter hirsutus, rostro apicem truncato, margine prope apicem utrinque inciso, lateribus acutè 5-serratis, serraturâ 4tâ fere medianâ, quoque subtilissimè denticulatis. Pedes marginibus pubescentes.*

Carapax subovate, scabrous and short hirsute, beak truncate at apex, and the margin near the apex either side incised; the sides acutely five-serrate, the fourth serrature being near the middle of the margin, also minute denticulate. Feet with the margins pubescent.

Off the coast of Patagonia, in fifty fathoms water. *Lieut. Case.*

Plate 18, fig. 7 *a*, animal, enlarged eight diameters; *b*, view of extremity of beak, more enlarged; *c*, under view, showing antennæ and mouth.

Length of carapax, one and a half lines. The extremity of the beak is cut square off, but has a sinuous apical margin, and either side, just at the angle, there is a longitudinal incision, separating a very narrow and acute lobe; the margin of the beak behind this is minutely denticulate. The five teeth of the margin are D, E, N, T, S, or the normal teeth; and the markings of the surface show that the medial region extends far back of the middle, as shown by the teeth. The eyes are on rather short pedicels, and are directed straight outward. The flagellum of the outer antennæ consists of nine or ten joints, and has a few short hairs; the whole length beyond the carapax is not one-third the length of the carapax. The outer maxillipeds are short hirsute, and the two do not quite meet on the medial line. The third joint is subquadrate, not at all oblong, with the anterior



inner angle deeply truncate; in length, about half the second. Abdomen hirsute. Hand short; fingers a little incurved, inner margin denticulate. Tarsus of following legs slender tapering, and nearly as long as two preceding joints, which two are subequal in length.

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#### IV. CRUSTACEA GRAPSOIDEA.

THE Grapsoidea correspond nearly to the Catometopa of Edwards. The Telphusa group is excluded, as having somewhat closer affinities with the Cancroidea.

In subdividing the Grapsoidea, we first observe a number of species in which the outer maxillipeds have a Cancroid character—the fourth joint articulated with the *inner* apex of the third joint—and which thus are unlike the great majority of the Grapsoidea. These may be considered as forming the transition to the Cancroidea; among them, the genus Eucrate has much the form of Pilumnus or Panopæus.

This group, the GONOPLACIDÆ, is different from that of other authors so called, in that the Macrophthalmi and related species are not included, as is evidently required by their characters.

The remaining Grapsoidea constitute naturally five families. One group has near relations to the Gonoplacidæ and Podophthalmidæ; it is the MACROPHTHALMIDÆ, under which are embraced, (1) Macrophthalmus and the related genus Cleistostoma; (2) Ocypoda and Gelasimus; and (3) Doto, making three subfamilies. The long eyes, narrow front, narrow male abdomen, as well as similarity of general form, even to the acute anterior angles of the carapax, require this union of the species; while the transverse or longitudinal position of the inner antennæ separates the Macrophthalminæ and Ocypodinæ, and the concealed termination of the outer maxillipeds, characterizes the Dotinæ.

The next family is the GRAPSIDÆ. They have shorter eyes and a longer front than the Macrophthalmidæ, a more depressed form, with

straight or arcuate sides, and a *wide* male abdomen, very nearly covering at its base, with few exceptions, the whole breadth of the sternum. The few exceptions with respect to the abdomen, here alluded to, are among species in which the short eyes, depressed form, and margined sides of the carapax are so distinct, that they could not, by any mistake, be referred to another family among the Grapsoidea. The genus *Helice* alone is ambiguous in its relations, being somewhat related to *Cleistostoma*; and through these groups the *Macrophthalmidæ* and *Grapsidæ* pass into one another; but both this genus and *Chasmagnathus* have the oblique piliferous crest upon the outer maxillipeds which is so characteristic of the *Sesarma* group, a peculiarity that does not occur among the true *Macrophthalmidæ*.

The fourth family is the *GEARCINIDÆ*—distinguished, as with other authors, by having an inflated form, and high, broadly-rounded sides, instead of anterior angles and a dentated lateral margin. The abdomen at base, as in most of the *Grapsidæ*, covers the whole breadth of the sternum. While all the *Grapsidæ* have the ridge on the prælabial plate or palate, bounding the efferent channel, very prominent, the *Gecarcinidæ* have no such ridge.

The fifth family is the *PINNOTHERIDÆ*. Like the last family, the body has rounded sides, but the form may be very much depressed, or much inflated. The male abdomen is very narrow, being much narrower at base than the corresponding part of the sternum. The genus *Pinnotherelia* forms a transition to the *Gecarcinidæ*, in having a rather broad front between the eyes, and the antennary fossettes separate. Some of the *Pinnotheridæ* have the second joint of the outer maxillipeds obsolete or obsolescent; but there are very gradual transitions among the species, to those in which the form is nearly the same as in certain of the *Gecarcinidæ*, with the second joint larger than the third. The eyes have regular orbits, but in some species related to *Hymenosoma*, the eyes are not retractile into orbits, any more than in *Pericera* among the *Maioid Crustacea*. A few species have a somewhat triangulate and subrostrate form, resembling the *Inachidæ*, with which group they were associated by early authors. This is most striking in the genus *Elamena*. But even here, the male abdomen and male sexual appendages have in all respects a *Grapsoid* character.

The sixth family is the *MYCTIRIDÆ*. The genus *Myctiris* is near the *Pinnotheridæ* in general form; but it has no distinct orbits. The



inner antennæ are longitudinal, as in the Ocypods, to which they have close relations; but the body is very narrow in front, and rounded tumid instead of quadrilateral.

The following is a brief recapitulation of the characters of these several families.

#### CRUSTACEA GRAPSOIDEA.

##### 1. *Articulus maxillipedis externi 4tus angulo 3tii interno articulatus.*

Fam. I. GONOPLACIDÆ.—Carapax transversus. Frons quartâ parte latitudinis carapacis longior, paulo deflexus, lamellatus. Antennæ internæ transversæ. Articulus abdominis *maris* 2dus sterno contiguo angustior.

##### 2. *Articulus maxillipedis externi 4tus angulo 3tii apicali interno non articulatus sed medio marginis apicalis sive angulo externo.*

Fam. II. MACROPHthalmidÆ.—Oculi tertiâ parte latitudinis carapacis non breviores. Carapax subquadratus sæpissime transversus, anticè latissimus, angulis anticis acutis, lateribus non arcuatis. Antennæ internæ sive transversæ, sive longitudinales. Articulus abdominis *maris* 2dus sterno contiguo angustior. Articulus maxillipedis externi 3tius cristâ obliquâ piliferâ nunquam ornatus.

Fam. III. GRAPSIDÆ.—Oculi tertiâ parte latitudinis carapacis breviores. Carapax subquadratus, sæpius depressus, lateribus aut rectis aut arcuatis. Antennæ internæ transversæ. Articulus abdominis *maris* 2dus sterno contiguo sæpius vix angustior. Articulus maxillipedis externi 3tius sive inornatus sive cristâ obliquâ piliferâ ornatus. Palatum colliculo viæ efferentis limite instructum.

Fam. IV. GECARCINIDÆ.—Oculi breves. Carapax obesus, paulo transversus, antice latus, curvatim declivis, lateribus arcuatis poneque oculos largè rotundatis, vix dentatis. Antennæ internæ transversæ. Articulus abdominis *maris* 2dus sterno postico vix angustior. Articulus maxillipedis externi 3tius cristâ obliquâ piliferâ non ornatus. Palatum colliculo viæ efferentis limite non instructum.

Fam. V. PINNOTHERIDÆ.—Oculi perbreves, orbitis insiti, raro non retractiles. Carapax sive obesus, sive depressus, raro paulo oblongus et interdum parce rostratus, lateribus valde rotundatis. Antennæ internæ aut transversæ aut obliquæ. Abdomen *maris* angustum, versus basin sterno contiguo valde angustius. Palatum colliculo viæ efferentis limite instructum. (Species omnes parvæ.)

Fam. VI. MYCTIRIDÆ.—Corpus obesum. Carapax antice perangustus, vix rostratus, orbitis carentes. Antennæ internæ parvulæ, longitudinales.

We do not believe in a properly lineal order in classification; yet the succession we have given to the families is a natural succession, as nearly as can be made. The *first*, Gonoplacidæ, link the Grapsoidea with the Cancroidea, and the genus Eucrate is very near Eriphia and Panopæus in form. The *second*, Macrophthalmidæ, is closely allied to the first, so much so that Macrophthalmus and Gonoplax have been arranged in the same group. The *third*, Grapsidæ, are again very near the Macrophthalmidæ, and the genus Helice is almost as correctly placed with one as the other. Thence the transition is as gradual also, to the *fourth* or Gecarcinidæ, and from the fourth to the *fifth* or Pinnotheridæ, and from the fifth to the *sixth* or Myctiridæ. Still, there are other relations of somewhat less prominence, which this order does not exhibit. The Myctiridæ are evidently an aberrant form, of inferior grade, intermediate between Pinnothera, Doto (or Ocypoda), and Helœcius. The resemblance of Elamena to Inachus was long since recognised.

The Gonoplacidæ are placed in the Cancer group by De Haan, who neglected the important distinction based on the male verges. The other genera, exclusive of Pinnothera and the species related, he divides into two groups, the *Ocypus* and *Grapsus* groups, the former having the fourth joint of the outer maxillipeds articulated with the outer angle of the third, and the latter, articulated with the middle of the apical margin,—a distinction difficult to carry out and dividing natural groups, as the Gecarcinidæ, Grapsidæ, &c. His genera of the OCYPUS group, are Doto, Scopimera, Myctiris, Gelasimus, Macrophthalmus, Cleistostoma, Cardisoma, Chasmagnathus, Helice, Uca, Ocypoda, Acanthopus (a division of Plagusia); those of the GRAPSUS group, are Gecarcinus, Philyra (division of Plagusia), Plagusia (ano-



ther division), Grapsus, Trichopus, Eriocheir, Pachysoma, Goniopsis, Platynotus, Brachynotus, Nautilograpsus, Cyclograpsus, and in his "Decas Septima," published in 1849, he unites with the group, Pinnotheres and Hymenosoma.

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#### FAMILY I. GONOPLACIDÆ.

THE following are the characters of the genera of Gonoplacidae :

Genus I. EUCRATE,\* *De Haan*. — Carapax anticè arcuatus, parce declivis, Panopæo formâ antennisque affinis. Appendices *maris* genitales e sterno ortæ abdominisque tectæ. Pedes *maris* antici breves, crassi. Oculi breves. Abdomen *maris* 5-articulatum, versus basin sterno contiguo vix angustius.

Genus II. CURTONOTUS, *De Haan*. † — Carapax antice arcuatus, parce declivis, margine antero-laterali rotundato. Appendices *maris* genitales e basi pedum ortæ in canaliculo sterni ductæ, deinde abdomine tectæ. Oculi breves. Pedes *maris* antici prælongi.

Genus III. GONOPLAX, *Leach*. — Carapax latus, trapezoidalis, anticè elongatè transversus, angulis anticis acutis. Appendicibus *maris* genitalibus *Curtonoto* affinis. Oculi longi. Pedes *maris* antici prælongi.

#### GENUS EUCRATE, *De Haan*.

The species of this genus have nearly the characters of *Pilumnus* or *Panopæus*, but the position of the male verges removes them from the Cancroidea. They differ from the *Curtonoti* in having these organs proceed from the sternum beneath the abdomen. Our species has a subtrapezoidal form, with the antero-lateral margin rounded, thin and dentate. Width of the front, about one-third the width of

\* *De Haan*, in *Faun. Japon.*, 36; *Geryon*, *Kröyer*, *Tidskr.*, i. (1837), 15, Pl. 1.

† *De Haan*, *Faun. Japon.*, p. 20. *Pseudorhombila*, *EDWARDS*, *Crust.*, ii. 58.

the carapax. Orbit with two fissures above and one below. Hands nearly equal, short and very stout. Sternum broad, but somewhat oblong, and the base of the abdomen is not broader than the corresponding part of the sternum. Buccal area broader anteriorly. Epistome as in the Cancridæ.

## EUCRATE CRASSIMANUS.

*Carapax nudus, bene areolatus, areolis 2 M 3 M discretis, quoque 5 L 6 L discretis, 2 L 3 L coalitis, 1 L 4 L obsoletis, margine antero-laterali 4-dentato, dentibus tribus posticis prominenter triangulatis; fronte fere recto, medium emarginato. Pedes antici crassi subæqui, nudi, læves, inermes, manu infra compressâ, carpo intus breviter acuminato, brachio marginem posticum prope apicem unidentato. Pedes 8 postici sat graciles, marginibus ciliati, tarso recto, infra hirsuto tantum.*

Carapax naked, areolate, areolets 2 M, 3 M separated, 5 L, 6 L also distinct, 2 L, 3 L coalesced, 1 L, 4 L obsolete. Antero-lateral margin four-toothed, three posterior teeth prominently triangular; front nearly straight, emarginate at middle. Anterior feet stout, subequal, naked, smooth, unarmed, hand compressed below, carpus with a low point on inner side, arm having a single obtuse spine or tooth on the hinder margin near apex. Eight posterior feet rather slender, margins ciliate, tarsus straight, hirsute only below.

Plate 19, fig. 2 *a*, male, natural size; *b*, abdomen and sternum of male, natural size; *c*, outer maxilliped; *d*, hand, natural size.

Rio Janeiro?

Length of carapax, ten lines; greatest breadth, thirteen lines; ratio of length to breadth, 1:1.3. The four teeth of the antero-lateral margin include the posterior angle of the orbit, which tooth (the first, corresponding normally to D and E) is truncate above and rounded behind; the others are subequal. Areolet 5 L has its anterior margin prominent and subacute, and nearly transverse. Areolet 2 F is slightly raised and circumscribed; but 1 M is not separate from 2 M.



## FAMILY II. MACROPHTHALMIDÆ.

THE Macrophthalmidæ are remarkable for the length of their eye-peduncles; for their trapezial or quadrate form, the anterior angles being prominent, and the breadth of the carapax generally greatest between them; and for having the male abdomen much narrower behind than the contiguous part of the sternum. The species of Grapsidæ which approach most to the Macrophthalmidæ have a ridge (usually piliferous), crossing obliquely the third joint of the outer maxillipeds, and may thus be distinguished, as this character belongs to no true Macrophthalmidæ.

In the genera of this family, the outer maxillipeds are wholly exposed, excepting in a small group, in which the extremity is concealed beneath the broader basal portion. And among those having these maxillipeds of the normal character, part have the inner antennæ transverse, and part longitudinal. There are thus three distinct sub-families in this family. Their characters and the distinctions of the genera they contain, are as follows:

SUBFAM. 1. MACROPHTHALMINÆ.—Antennæ internæ transversæ, sub fronte insitæ. Antennæ externæ basi frontem appressæ. Articulæ maxillipedis externi 4tus apertus.

G. 1. CLEISTOSTOMA, *De H.\**—Carapax subquadratus, paulo transversus. Frons quartâ parte latitudinis carapacis vix brevior. Oculi longiusculi. Pedes antici *maris femineve* breves. Articulæ maxillipedis externi 3tius 2do vix minor, quadratus.

G. 2. MACROPHTHALMUS, *Latr.*—Carapax latus, transversim rectangulatus. Frons angustissimus. Oculi longissimi. Articulæ maxillipedis externi 3tius 2do multo minor.

SUBFAM. 2. OCYPODINÆ.—Antennæ internæ longitudinales, juxta frontem utrinque insitæ. Antennæ externæ fronte paulum remotæ. Articulæ maxillipedis externi 4tus apertus, 3tius 2do minor.

1. *Articulæ maxillipedis externi 2dus 3tio valde major.*

G. 1. GELASIMUS, *Latr.*—Oculi graciles, cornicâ parvulâ, parce oblongâ. Pedes

\* *Crust., Faun. Japon., p. 26.*—From *κλειστός*, *shut*, and *στόμα*, *mouth*—not *Cleistotoma*.

*maris* antici portentosè inæqui. Manus minor debilis, digitis sæpissimè instar cochlearis excavatis aut spatulatis.

G. 2. HELÆCIUS, *Dana*. \*—Oculis habituque *Gelasimo* affinis. Pedes antici subæqui. Abdomen versus basin sterno contiguo vix angustius. Maxillipedes externi sulco lineari fere longitudinali superficie notati.

G. 3. OCYPODA, *Fabr.*—Oculi crassi, corneâ longâ, fere ad pedunculi basin productâ. Pedes *maris* antici inæqui, minoris digitis acuminatis. Abdomen basi angustum. Carapax transversus.

2. *Articulus maxillipedis externi 2dus 3tio parce major, non oblongus.*

G. 4. SCOPIMERA, † *De H.*—Corpus globoso-cubicum. Pedes *maris* antici subæqui, non crassi. Habitu *Gelasimo* affinis.

SUBFAM. 3. DOTINÆ. — Articuli maxillipedis externi 4tus et sequentes 3tio celati.

Genus DOTO, *De H.* †—Corpus subquadratum.

#### SUBFAMILY I. MACROPHTHALMINÆ.

##### GENUS CLEISTOSTOMA, *De Haan.*

The genus *Cleistostoma* has the front narrower than in *Helice*, though still, not less than one-fourth the breadth of the carapax, and it does not coalesce with the septum below. The eyes are also longer, the body thinner, the third joint of the outer maxillipeds quadrate. The anterior feet in the male, are of moderate length.

##### CLEISTOSTOMA BOSCHII? (*Audouin*), *Edwards.*

Plate 19, fig. 3 *a*, animal, enlarged; *b*, outer maxilliped; *c*, hand, enlarged; *d*, male abdomen and sternum in part.

Feejee Group, Rewa Reef, Viti Lebu.

\* Includes *Gelasimus cordiformis*.

† Crust., Faun. Japon., p. 24.

‡ Crust., Faun. Japon., p. 24.



Length of carapax, 3 lines; breadth, 3·85 lines; ratio of length to breadth, 1 : 1·28. The fissures about the medial region are deep and in part a little hairy. The carapax is granulous; the tarsus is striated and unarmed. There is a single emargination in the lateral margin anteriorly, and this margin is somewhat hairy. The hand and the stout tooth near base of moveable finger, are as figured by Krauss. The other finger is slightly channeled, and a faint ridge extends from it backwards over the surface of the hand. The abdomen of male differs a little from his figure, in having the breadth hardly increased at the penult segment, and hardly any more so at the third segment; the breadth slightly diminishes from the third segment towards apex. The hand and fingers on the inner surface are densely hairy. The abdomen and sternum are smooth, naked, and shining.

*Macrophthalmus Boscii*, AUDOUIN, Expl., pl. Egypt.

*Cleistotoma Boscii*, EDWARDS, Crust., ii. 68.

• *Macrophthalmus Boscii*, KRAUSS, Südaf. Crust., pl. 2, f. 5, p. 40.

#### GENUS MACROPHTHALMUS.

##### MACROPHTHALMUS TELESCOPICUS.

###### Sandwich Islands.

*Gelasimus telescopicus*, OWEN, Voyage of the Blossom, Crustacea, p. 78, pl. 24, f. 1, 1839.

*Macrophthalmus compressipes*, RANDALL, Jour. Acad. Nat. Sci. Philadelphia, viii. 123, 1840.

*Macrophthalmus podophthalmus*, EYDOUX and SOULEYET, Voy. de la Bonite, pl. 3, f. 67.

##### MACROPHTHALMUS PACIFICUS.

*Carapax valde transversus, nudus et lævis, regione medianâ valde circumscriptâ, margine laterali arcuato, antè 2-emarginato, emarginatione anteriore profundâ, posteriore obsolescente; fronte latiusculo, lateribus non excavato. Oculi graciles, sat breves, tertiam latitudinis carapacis partem longitudine æquantès. Pedes maris antici parvuli, læves, manu extus nudâ, subtiliter punctatâ et non costatâ, digito*

*inferiore non deflexo. Pedes postici marginibus pubescentes, articulo pedis 4ti 3tio duplo latiore quam 5tus, apice cum dente acuto armato.*

Carapax wide transverse, naked and smooth, median region deeply circumscribed, lateral margin arcuate, with two emarginations anteriorly, the first deep, the second obsolescent; front rather broad, its sides not excavate. Eyes slender, rather short, as long as one-third the breadth of carapax. Anterior feet of male small, smooth, hand naked on outer surface, minutely punctate, and not costate, lower finger not bent downward at all. Posterior feet with pubescent margins, third joint of fourth pair twice as broad as fifth joint, and having a spiniform tooth at apex.

Plate 19, fig. 4 *a*, male, enlarged two diameters; *b*, abdomen, *ibid.*; *c*, hand, *ibid.*

Island of Upolu, Samoan Group.

Length of carapax of a male, four lines; breadth, five and two-thirds lines; ratio of length to breadth, 1:1.42. This species, owing to its arcuate sides, is narrower in front than some distance back, and the anterior outer angle projects much less outward than the tooth behind the first emargination, the sides from this tooth inclining inward instead of outward. The eye scarcely reaches the outer angle. The sides are not indented posterior to the second emargination. The feet are all unarmed. The fingers are very finely denticulate, and there is a low, broad tooth near base of moveable finger. The lower margin of hand and lower finger make a continuous straight line. The inner denticulate margin of the other finger is slightly two-lobed; its outer surface is slightly channeled. The front, as seen in a front view, is truncate below with the centre very slightly prominent.

*M. pacificus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 248.

## SUBFAMILY II. OCYPODINÆ.

### GENUS GELASIMUS.

We have separated from *Gelasimus* the group with equal hands



to constitute the genus *Helœcius*. The most striking peculiarity of the species of *Gelasimus*, as adopted, is the very great inequality of the hands in males. In this character, and also the spatulate or spoon-excavate character of the fingers of the smaller hand, and the very slender eyes with short cornea, the species are very unlike those of the genus *Ocypoda*. The *Gelasimi*, moreover, are marsh species, while the *Ocypoda* are found about sand beaches.

#### GELASIMUS NITIDUS.

*G. Duperreyi similis.* *Carapax nitidus, antice paulo arcuatus, fronte angustissimo, supra paulo constricto. Pedes maris antici valde inæqui, manu majore valde compressâ et latâ, extus valde granulâtâ, intus cristis duobus obliquis ornatâ, digito superiore laminato, fere duplo latiore quam inferior, inferiore juxta basin uni-dentigero. Pedes 8 postici fere nudi, articulo 3tio pedis quinti perangusto.*

Near the *Duperreyi*. Carapax shining, a little arcuate anteriorly, front very narrow, and somewhat narrow constricted above. Anterior feet of *male* very unequal, the larger hand much compressed and broad, strongly granulous without, and having two oblique crests within, one towards lower margin; upper finger laminate, nearly twice as broad as lower, the lower with a prominent tooth near base. Eight posterior feet nearly naked, the third joint of fifth pair very narrow.

Plate 19, fig. 5 *a*, male, natural size; *b*, abdomen and sternum, enlarged two diameters; *c*, outer view of larger hand of male, natural size; *d*, inner view, showing the two crests, natural size.

From the Feejee Islands.

Length of carapax of a male, six and one-fourth lines; breadth between anterior angles, nine lines; length of large hand, sixteen lines; length of moveable finger, nine lines; and its greatest breadth, three lines. The crests on the inner surface of the hand are made up of largish granules; one is near the articulating side, and the other towards the lower margin; the lower finger terminates in two

points, and has the inner surface twice concave and denticulate. The male abdomen is flat or nearly so.

*H. nitidus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 248.

GELASIMUS DUPERREYI, *Guérin*.

Tongatabu and Upolu.

Length of carapax of a male, nine lines; breadth between the anterior angles (greatest breadth), thirteen lines; ratio, 1 : 1.44; length of hand, one inch six and a half lines. Colours, brownish red, or purplish, marbled with white, but varying much.

This species is near the *nitidus*, but has much narrower fingers and less compressed hand, yet the hand is equally large. There is a large open space between the fingers when they are closed. Anterior margin of carapax strongly arcuate, the anterior angles being much behind the line of the front, and the lateral margins quite to these angles straight or slightly concave. Surface smooth and shining. Legs nearly naked; anterior pair very unequal, the larger hand obtuse and nearly straight above, very minutely granulous on outer surface; basal portion rather longer than broad; inner surface with the lower crest (so prominent in the *nitidus*) obsolete; upper finger narrowing from base to apex, and somewhat bending downward, lower margin somewhat concave, granulous, but not lobed or dentate; lower finger with upper margin granulous, and two low elevations on outer half. Arm with anterior margin hardly acute, entire, and terminating above in an acute or subacute tooth. Eight posterior legs nearly naked; tarsus fringed either side with hairs.

The front is narrow, but not narrower between the eyes than below; the lower margin of the orbit is crenulate.

*G. Duperreyi*, GUERIN, Voy. de la Coquille, pl. 1, f. 2.

GELASIMUS ANNULIPES, *Latreille*.

Singapore, East Indies.



The breadth of the front and narrower fingers, readily distinguish this species from the *nitidus*.

*G. annulipes*, EDWARDS, Crust., ii. 55.

GELASIMUS VOCANS (*Degeer*), *Desmarest*.

Rio Janeiro.

Length of carapax of a male, nine and two-thirds lines; greatest breadth, fifteen lines; ratio, 1 : 1.55; length of hand, two inches and five lines. The greatest breadth of the carapax is posterior to the line of the anterior angles; for the sides, instead of being straight convergent from the anterior angles, are somewhat arcuate, they being first divergent and then longitudinal before converging behind. The front is broad subtriangular and rounded below.

*Cancer vocans*, DEGEER, Mem. pour servir, etc., vii. pl. 26, f. 12.

*Gelasimus vocans*, DESMAREST, Crust., p. 123; EDWARDS, Crust., ii. 54, and Cuv. Règne An., pl. 18, f. 1.

GELASIMUS MARACOANI, *Latreille*.

Rio Janeiro.

Length of carapax of a male, eleven and a half lines; breadth, seventeen lines; ratio, 1 : 1.48; length of hand, two inches and two lines. The anterior part of the lateral margin is longitudinal, and the breadth in the line of the anterior angles is hardly less than that a short distance posteriorly. From the posterior part of this longitudinal portion a line of granules commences, which extends backward near the sides of the carapax, with an inward curve. The upper surface of the fourth joint of the eight posterior legs is short tomentose, and so also, in part, that of the next joint. The basal portion of the hand is small pustulous, while the lower finger is dark punctate. The anterior margin is nearly straight transverse.

In another male specimen from Rio Janeiro, closely like the preceding in the characters of the carapax, the front, the eight posterior legs, and the maxillipeds, the large hand is not more than half as

long, being shorter than the breadth of the carapax. The hand at base is only fine granulous; the upper and moveable finger is broadest towards base and narrow towards apex; the lower finger has the apex curved outward; the arm is not crested on the anterior margin. It may be an individual of the *G. maracoani*, with the right or large hand partly grown after mutilation. Length of carapax, twelve and three-fourths lines; breadth, eighteen and three-fourths lines; breadth across the anterior angles slightly greater than that a short distance posteriorly.

*G. maracoani*, LATR. Encyc., pl. 296, f. 1; EDWARDS, ii. 51.

GENUS HELŒCIUS, Dana.

*Gelasimo affinis, antennis internis longitudinalibus, juxta frontem utrinque insitis, externis fronte paulum remotis, articulo maxillipedis externi 3tio brevioribus quam 2dus. Pedes maris antici subæqui. Articuli maxillipedis externi 2dus 3tiusque sulco lineato fere longitudinali bene notati. Abdominis articulus 2dus maris sterno vix angustior.*

Related to *Gelasimus*, the inner antennæ being longitudinal either side of the front, and the outer at a distance from the front, and the third joint of the outer maxillipeds being much smaller than the second. Anterior feet of *male* subequal. Second and third joints of outer maxillipeds marked with a linear sulcus, which is nearly longitudinal. Second joint of *male* abdomen hardly narrower than the sternum behind.

One of the species here included, the *cordiformis*, has been referred to *Gelasimus*. But in *Gelasimus*, the outer maxillipeds have seldom the sulcus here described, the anterior feet are always very unequal, and the male abdomen at base is much narrower than the sternum behind. Besides, the habit is different. The buccal mass is somewhat projecting, approaching that of *Doto* and *Myctiris*; the surface just back of the anterior angles of the carapax is more abruptly inclined, being nearly vertical for a short distance, which gives this portion of the animal a fulness not seen in *Gelasimus*, and the orbits the appearance of a somewhat lower position, in a front view. Yet the general



form is very much as in *Gelasimus*. There is no hiatus in the outer margin of the orbit in the species seen by us. The sulci of the outer maxillipeds converge backward, and have the form of a letter V, with the sides convex outward. The aspect is somewhat like that of *Gonoplax*; but the third joint of the outer maxillipeds bears the following at its outer instead of inner angle, and the fourth joint has the outer surface more convex. The front in our species is very narrow, but not narrower between the eyes than below. The under surface of the third joint of the six anterior legs is densely hairy or woolly, which is not true of any *Gelasimi*, as far as observed by the writer. The male abdomen widens a little towards its base, and its first or second joint is hardly narrower than the third, and as wide as the sternum corresponding. The lateral margin in the species is somewhat convex anteriorly, the greatest breadth being posterior to the anterior angles.

The genus is evidently intermediate between *Gelasimus* and *Doto*. The name is derived from *ίλος*, *marsh*, and *οικος*, *house*.

HELECIUS CORDIFORMIS (*Latreille*), *Dana*.

Plate 19, fig. 6 *a*, natural size; *b*, hand, natural size.

New South Wales.

Length of carapax of a male, seven and a half lines; breadth, eleven and three-fourths lines; ratio, 1 : 1.57; length of larger hand, with moveable finger extended, fourteen lines; of same, to apex of lower finger, eleven and a half lines; length of carpus, five and one-third lines, and breadth, two and a half lines; length of hand, anterior to fingers, measured to lower basal angle, eight and one-third lines, and breadth, four lines. The last segment of the male abdomen is not as short transverse as in the *inornatus*, and though narrower than the preceding, is not abruptly so; it appears to have a triangular form, owing to the dense hairs at apex; the other abdominal segments also are shorter transverse. The hand enlarges from the base outward, and the part below the fingers is more oblong than in that species, and somewhat triangular in form. The buccal mass is more projecting. We have suspected that the *inornatus* may be only a younger condition of the *cordiformis*; but the size is not very unlike,

and we cannot therefore reconcile on this ground the different proportions in all the particulars stated.

HELÆCIUS INORNATUS.

*Carapax convexus, nudus, angulis anticis fronte posterioribus. Pedes antici sat breves; carpo non duplo longiore quam latiore, margine interno angulato; manu latâ, parte antedigitali paulo oblongâ. Segmentum abdominis maris ultimum breviter transversum, penultimo subito angustius. Articulus pedum tertius supra tomentosus.*

Carapax convex, naked, anterior angles posterior to line of front. Anterior feet moderately short; carpus not twice as long as broad, inner margin having an angle near middle; hand broad, part preceding fingers somewhat oblong. Last segment of male abdomen short transverse, abruptly narrower than the penult. Third joint of the feet tomentose above.

Plate 19, fig. 7 *a*, male, natural size; *b*, front, seen from below obliquely, enlarged; *c*, hand, natural size.

New South Wales?

Length of carapax of male, six lines; breadth, eight and three-fourths lines; ratio, 1 : 1.48; length of larger hand with the moveable finger extended, equal to breadth of carapax; length of hand to apex of lower finger, eight lines; length of carpus, four lines, and greatest breadth, two and one-fourth to two and one-third lines; length of hand anterior to fingers, measured to lower basal angle, five and one-third lines, and its breadth, three and one-fourth lines. The medial region of the carapax is partly circumscribed. The right hand is largest in one specimen, and the left in another.

These dimensions differ from those of the *H. cordiformis*. The hand and carpus are both more oblong in the *cordiformis*. Either side of the buccal area there is a smooth, flat, or slightly concave surface, which narrows anteriorly; the same surface in the *cordiformis* is narrower and much more concave. In both species, the surface either side adjoining the upper outer angle of the buccal area is granulous,



and the pterygostomian region, as well as the lower portion of the orbit near the buccal area, has a sparse covering of short hairs.

*H. inornatus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 248.

#### GENUS OCYPODA.

In Ocyпода, the body is very nearly rectangular in form, the sides not converging backward, as is usual in *Gelasimus*. The lateral margin of the upper surface has a distinct border, which converges somewhat behind, from a point a short distance from the anterior angles, yet the convergence is much less than in *Gelasimus*; but the lower lateral margin upon the sides does not incline inward at all, and even diverges from the medial line in some species. Besides this character, the less equal hands in males, the pointed fingers of both hands, and the stout eye-peduncles, covered with the cornea nearly to the base, remove the species from *Gelasimus*.

These species are able to make a sound, by means of a series of minute ridges on the inner surface of the hand, which acts like a rasp against a prominent edge on the second joint of the same pair of legs. The surface adjoining both the rasp and the edge is usually short hairy.

In males, the first suture in the sternum is posterior to the last articulation of the abdomen, while it is anterior in *Grapsus*.

#### 1. *Oculi pedunculus apice non productus.*

#### OCYPODA RHOMBEA, *Fabr.*

Plate 19, fig. 8 *a*, male, natural size; *b*, abdomen and sternum; *c*, hand.

Rio Janeiro.

Length of a female, seventeen and one-fourth lines; breadth across middle, twenty-one and a half lines; ratio, 1 : 1.25; length of a male, sixteen lines; breadth across the middle, nineteen and a half lines;

ratio, 1:1.22. The sides, as seen from above, diverge somewhat backward, so that the breadth just over the third pair of legs, is twenty-two and a half lines in the female, and twenty and a half lines in the male. Also, the breadth at the anterior angles is twenty lines in the female, and seventeen and a half lines in the male.

As the species *arenaria* and *rhombea* have both hairy legs, and appear to be at times confounded, we describe with some detail the specimens here referred to *rhombea*.

Anterior angles of carapax not posterior to any part of the upper orbital margin. Lateral margin fine serrulate. Inferior margin of orbits denticulate. Anterior margin of the arm with irregular spini-form teeth. Carpus mostly smooth on its upper surface. Hand rough granulous on its outer as well as inner surface, somewhat spinous above, and spini-dentate on the lower margin; moveable finger also subspinous. The crest on the inner surface of the hand, near the articulation, naked. Part of hand anterior to fingers, in male, ten lines broad; length of same to posterior margin of upper half, ten and a half lines; distance between the lower posterior angle and a point between the bases of the two fingers, eleven and a half lines. In the female, the proportions are about the same, but the hand is smaller (its breadth seven lines), and it is much more nearly smooth. The third joint of the eight posterior legs has smooth sides, and a narrow upper border which is indented and hirsute at the indentations; in the fifth pair there is also a lower border; the under side in the second and third pairs especially has its two margins hairy. The fourth joint is sulcate above, especially for the second and third pairs, the margins either side of the sulcus hirsute. The fifth joint of the second and third pairs is densely hairy along a medial line on the posterior surface, as well as on the upper and under margins, and along two or three lines on the anterior surface. The tarsus enlarges somewhat towards its extremity. The male abdomen has the penult segment narrowing slightly towards its apex with a curve, being broadest at its base, and the last segment is oblong triangular. The third joint of the outer maxillipeds is as long as broad, and faintly granulous near the margins.

*Ocyropa rhombea*, FABR., Suppl., p. 348; EDWARDS, Crust., ii. 6.



OCYPODA PALLIDULA, *Hombron and Jacquinot.*

Plate 20, fig. 1 *a*, male, natural size; *b*, hand, enlarged; *c*, extremity of fourth pair of legs.

## Tongatabu.

This species, figured by Hombron and Jacquinot in the Zoological Atlas of the Voyage au Pole Sud, in the *Astrolabe* and *Zélée*, under D'Urville, has not been described, and we refer our specimens here with hesitation. They give us the following characters. Length of carapax, seven lines; breadth, eight and one-sixth lines; ratio, 1:1.16. Peduncle of eye but slightly wider at tip of cornea than it is a short distance below. Legs not at all spinulous, the fifth joint short and thin, pubescent above as well as on the sides, but not dense hairy. Larger hand short and very broad, the part anterior to the fingers being even broader than long, outer surface fine granulous, not coarser above; lower finger at base rather broader than half its length. Inner surface also granulous, especially its lower part; and there is a crest upon this surface near the articulation, but it is not hairy. Last joint of the male abdomen triangular and about equilateral; surface of the carapax quite evenly fine granulous. Anterior angles advanced, and in a line with the inner part of the upper margin of the orbit, or but slightly posterior to it. The lateral surfaces of the body are parallel and not divergent behind. The third joint of the outer maxillipeds is hardly as long as broad, and the surface is uneven, being granulous near the opposite margins. The tarsi are not wider towards their tips. The eye reaches almost to the very base of the peduncle, the interval left being much less than the breadth of the peduncle at base.

The figure of an Ocypod by Savigny, in the work on Egypt (Plate 1, fig. 2), referred to *O. rhombea* by Audouin, has a close resemblance to the above.

*O. CORDIMANA?* *Latr.*—In Balabac Straits, two small specimens of a species of Ocypod were collected, probably young, which have the carapax as in *cordimana*, the anterior angles scarcely projecting ante-

rior to the upper orbital margin adjoining, but none of the joints of the legs are spinulous. The larger hand is more oblong than in *pallidula*. The tarsus is also much more slender than in *pallidula*, and not at all enlarged towards its extremity. The legs are but little pubescent, and not hairy, like those of *arenaria*.

## OCYPODA LÆVIS.

*Carapax omnino subtiliter granulatus, angulis anticis antice productis et acutis. Pedes fere nudi; antici inermes, manu perlatâ et brevi, subtiliter granulata, parte ante digitos transversâ, marginibus non denticatis, inferiore subtiliter denticulato, digito inferiore ad basin longitudine ejus parce angustiore; 8 postici læves, articulo 5to breviter pubescentes, parium 2di 3ti que apice latereque anteriore breviter denseque pubescenti, tarso versus apicem non latiore, basi pubescente. Abdominis segmentum maris ultimum æquilateraliter triangulatum.*

Carapax throughout fine granulous, anterior angles produced forward and acute. Feet nearly naked; anterior pair unarmed, hand very broad and short, finely granulate, the part before fingers transverse, margins unarmed, lower very minutely denticulate, lower finger at base nearly as broad as its length, eight posterior legs smooth, fifth joint short pubescent, in second and third pairs a dense short pubescence towards apex of this joint and on its anterior surface; tarsus not broader towards apex, pubescent at base. Last abdominal segment equilaterally triangular.

Sandwich Islands.

Plate 20, fig. 2, larger hand of male, showing its form.

Length of carapax, seven lines; breadth, anteriorly, eight and one-half lines; ratio, 1 : 1.21. The larger hand, as well as lower finger, is shorter for its breadth than the same in the *pallidula*; the second and third pairs of legs have the fifth joint densely (instead of sparsely) pubescent, the pubescence in both species short; the peduncle of the eye at the tip of the cornea is twice as broad as it is a short distance below, being in this part suborbicular in outline. It is readily distin-



guished from the *rhombea* and *arenaria* by its nearly naked legs; and from the *cordimana* in not having the lower margin of the larger hand dentate or denticulate, as well as in the other legs, which are wholly unarmed. The hands have a very smooth look, the upper margin is fine granulate like the outer surface; the vertical crest on the inner surface is naked. The surface of the sternum behind the mouth bears a few short hairs. The anterior angle of the carapax is in the same line with the inner part of the superior orbital margin.

2. *Oculi pedunculus apice productus.*

OCYPODA BREVICORNIS, *Edwards.*

Plate 20, fig. 3 *a*, female, natural size; *b*, eye of another female.

Feejees or Tongatabu.

Length of carapax of a female (the eye of which is represented in figure *b*), sixteen and a half lines; greatest breadth (across the line of the anterior angles), nineteen lines; ratio, 1 : 1.15. Another specimen (fig. *a*), length, fourteen lines; breadth, sixteen lines; ratio, 1 : 1.14.

The specimens referred to this species are females. They have the short ophthalmic horn of the *brevicornis*, its length being about a fourth as great as the rest of the eye or less. The hand is closely granulous, the granules small and hardly pointed; the length anterior to the fingers not greater than breadth of same. The fingers are flattened and tapering. The anterior surface of the fifth joint on the second and third pairs has but one dense line of hairs, and sometimes another much less distinct. The outer maxillipeds are also similar, the third joint being longer than broad, and the surface near either margin being granulous. The small prominence within the orbit near its inner limit, a short distance from the outer antennæ, is denticulate.

How far the length of the horn admits of variation in a species, we cannot decide from the facts within our knowledge. It is possible that the *pallidula* is only young of this species.

In one specimen (that represented in figure 3 *a*), the eye termi-

nates in a short point, very slightly elongated. The anterior surface of the fifth joint in the second and third pairs of legs has two dense lines of short hairs; on the second pair the smallest line is below the medial one, and on the third pair it is above. In other respects, the specimens are essentially identical.

Variety *longicornuta*. Plate 20, fig. 4 *a*, male, natural size; *b*, abdomen and sternum; *c*, larger hand, natural size; *d*, extremity of leg of third pair; *e*, outer maxilliped.

Tongatabu, Pacific; also, from Singapore.

This variety has the long horn of the *ceratophthalma* (*O. cursor*), but the carpus has a regularly convex surface, as in the *brevicornis*. In nearly all its characters excepting the horn of the eye, it agrees with the *brevicornis*. But the basal joint of the inner antennæ appears to be more globular and less oblong.

*Tongatabu* specimen, a male. Length of carapax, seventeen lines; greatest breadth, nineteen and two-thirds lines; ratio, 1:1.15. The anterior angle of the carapax is a right angle; it does not project forward of the upper orbital margin adjoining it. The breadth of the body is as great in front as over the third pair of legs. The horn of the eye is cylindrical, and as long as the eye to its basal articulation. The third joint of the outer maxillipeds is somewhat oblong, and near either margin granulous. The large hand is coarse granulous, somewhat spinous above, and short spini-dentate below. The hand anterior to the fingers is nine and a half lines broad, and the same in length, measuring the length to the posterior margin above the articulation. Inner surface of hand granulous below and above, and dense hairy in an oblique line near the articulation. Carpus similarly granulous. Arm unevenly spini-dentate on anterior margin. Eight posterior legs without hairs on the margins, surface granuloso-rugate; anterior surface of fifth joint of second and third pairs with two or three dense rows of short hairs; tarsus widened towards extremity. Abdomen of male with penult joint not narrower at middle than at base, last joint triangular, slightly oblong.

Specimen from *Singapore*, a female. Length of carapax, sixteen lines; breadth, eighteen and a half lines; ratio, 1:1.16. In



general, corresponding to the above description. Horn of eye shorter, about half as long as preceding part of eye. Large hand somewhat smaller and not so rough above, but of the same proportions. Third joint of outer maxilliped two and a half lines long, two lines wide at base. Anterior surface of fifth joint of second and third pairs of legs with only two dense rows of hairs, and one of these obsolescent. The hairy oblique line on inner surface of hand near articulation much narrower or less hairy.

The lateral margins of upper surface of carapax in both are anteriorly for a short distance parallel.

#### OCYPODA URVILLII, *Guerin*.

Plate 20, fig. 5 *a*, outline of male, natural size; *b*, outer maxillipeds, enlarged three and a half diameters; *c*, outline of larger hand, enlarged two and a half diameters.

#### Sandwich Islands.

This species resembles the *brevicornis*, as it has the eyes barely tipped with a short point. But it is a somewhat broader species: length of a male, six and a half lines; breadth, eight lines; ratio, 1 : 1.23. The outer maxillipeds differ in having the second and third joints *very nearly smooth* and *somewhat shining*, and the third joint is transverse, and much broader at base than at apex. The large hand is broad and fine granulous, and the carpus is acute at the outer as well as inner angle. The smaller hand is of the usual form. The tarsus of the following pairs is not wider towards its extremity. Penult joint of male abdomen about as long as broad. Base of inner antennæ a large pearly-looking joint. Prominence within orbit near its inner limit not denticulate, a little pubescent. Fifth joint of second and third pairs of legs somewhat pubescent, and with a few minute stiffer hairs.

Carapax evenly granulous; as broad at the anterior angles as posteriorly, these angles very slightly advanced, but much posterior to inner part of upper orbital margin. Pterygostomian region nearly smooth.

We cannot be confident that this is the *Urvillii* figured in the Coquille, for want of details connected with that figure; but it appears

to be the species so called by Owen in his account of the Crustacea of the Voyage of the Blossom.

*O. Urvillii*, GUERIN, Voyage de la Coquille, pl. 1, f. 1; OWEN, Voy. of the Blossom, p. 80; EDWARDS, Crust., ii. 49.

OCYPODA GAUDICHAUDII, *Edw. and Lucas.*

Valparaiso, Chili.

*O. Gaudichaudii*, EDWARDS and LUCAS, D'Orbigny's S. A., p. 26, pl. 11, f. 4.

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FAMILY III. GRAPSIDÆ.

WE have divided the Grapsidæ into three subfamilies:—the inner antennæ exposed in a longitudinal sinus of the front characterize one group, the *Plagusinæ*; and the rest (having the same antennæ covered by the front), are divided according as the third joint of the outer maxillipeds is crossed or not by a ridge (usually hairy) that passes obliquely over the outer angle or outer surface of the second joint; one division being the *Grapsinæ*, the other the *Sesarminæ*. The existence of this oblique ridge, so well marked in *Sesarma*, has not in all instances been allowed the authority of a generic characteristic. Yet it seems to us that it should have even the higher importance, here attributed to it.

De Haan divides the genus *Grapsus* according to the form of the third joint of the maxillipeds, his *Grapsi* (constituting a subgenus in his system) having this joint scarcely longer than broad; and his *Goniopses* having this joint oblong, or as long as the second joint. The former include in part the *Cyclograpsi* of Milne Edwards. A somewhat similar subdivision was subsequently made, by Dr. Randall, in volume viii., pp. 124 and 126, of the Journal of the Academy of Natural Sciences of Philadelphia, published in 1839. He retained for the genus *Grapsus*, De Haan's *Goniopsis*, and called the species with the



third joint of the outer maxillipeds short and broad, *Pachygrapsi*—excluding, however, Edwards's *Cyclograpsi*. It is important then to ascertain what are the natural groups among these species. In external form, there are two groups of very obvious and trenchant characters: the first having arcuate sides, and a front not as long as half the breadth of the carapax, as the *pictus*, *strigosus*, and *variegatus*; the second having straight sides, often convergent backward, and a front longer than half the breadth of the carapax, like the *cruentatus*, *messor*, and *plicatus*. These groups appear to be natural and of equal importance; and the latter forms a transition to *Sesarma*. In the former, the outer antennæ come out either side of the front; in the latter, often from directly beneath the front. May we retain these as true genera, or are other subdivisions indicated by the outer maxillipeds? As to the length of the third joint of these organs, we would observe, that there are the oblong and the short forms, in both of these groups. In the former group, the two varieties connect by very gentle gradations. In the *pictus*, the third joint is but slightly shorter than the second; in the *strigosus*, the difference is a little greater; in the *planifrons*, a species from Valparaiso, so resembling the *variegatus* that it has apparently been called by this name, the length does not exceed the breadth. The *variegatus*, having a nearly horizontal front like the *planifrons*, has the same joint oblong as in the *pictus*, the latter species with a vertical front. The variations in the form of this joint hence do not correspond with any peculiar character in the front; and they occur among species that have the same general outline, that is, arcuate sides and a short front. Again, among the square Grapsi, there are both kinds: the *cruentatus* has the third joint of the outer maxillipeds as long as the second joint; in the *plicatus* it is a little oblong; and in the *messor* and *Thukujar* it is as broad as long. If we follow then the peculiarities of this joint, we must either divide in two or more parts each of the groups pointed out, or associate the species without reference to what seem to be characters of quite as great importance, the character of the front and general form of the species. For ourselves, we deem it best to disregard the form of this maxilliped joint, since we have found that even in the genus *Xantho* (for example), it may be both transverse and oblong. We therefore divide the genus *Grapsus* into GRAPSUS proper, in which the sides are arcuate and front narrow; and GONIOGRAPSUS, with the sides straight and front long. The latter group is not the *Goniopsis* of De Haan, nor the *Pachygrapsus*

of Randall, and hence to avoid confusion, we do not adopt either of these generic names. The *cruentatus* is so like the *messor* and *plicatus* in habit, that we cannot disjoin them on the grounds of the difference alluded to; and it is so different from the *pictus* in this respect (the former a salt marsh species, the latter—like the *variegatus* and *planifrons*—a rapid runner over the rocks of an open sea-shore), that we cannot believe in the propriety of their union.

Other changes have been found necessary, besides the introduction of some new genera. For example, it appears that *Gnathochasmus* of M'Leay, and *Cyclograpsus* of Edwards, were introduced upon related types, and are essentially identical, and that the latter must be retained as having the precedence in time. A portion of Edwards's Cyclograpsi, not having the typical character and not answering to his description (requiring the third joint of the outer maxillipeds to be crossed by an oblique piliferous crest), forms naturally a distinct group. They are true *Grapsinæ*, while the Cyclograpsi are *Sesarminæ*. We have not felt at liberty to adopt M'Leay's name for Cyclograpsus, and Cyclograpsus for the latter group, as is done by Gray, in the Catalogue of the Crustacea of the British Museum, as we are at no liberty to misuse Edwards's name; and we therefore give the second group a distinct name, calling it Hemigrapsus. As above stated, the species are *De Haan's* Grapsi.

Other changes introduced will be remarked upon beyond.

A constant characteristic of the Grapsidæ is the division of the palate by a ridge separating the efferent channel from the middle of the plate, as in the Eriphiæ, and most Portunidæ. This peculiarity separates them from the Gecarcinidæ, and from most, also, of the Macrophthalmidæ. The Eriphidæ, in the palate or efferent channel, as well as general form, are thus the connecting link between the Cancrinea and Grapsidæ.

The following is a synopsis of the subfamilies and genera of Grapsidæ :

1. GRAPSINÆ.—Antennæ internæ fronte tectæ. Articulæ maxillipedis externi 3tius costâ obliquâ in 2dum productâ non ornatus.

1. *Maxillipedes externi vix hiantes.*

G. 1. PSEUDOGRAPSUS, *Edw.* — Articulæ maxillipedis externi 3tius orbiculatocordatus, aut subquadratus, 2do brevior. Frons dimidio latitudinis carapacis vix brevior. Carapax lateribus arcuatus.



- G. 2. HETEROGRAPSUS, Lucas.\* — *Pseudograpsus* similis. Carapacis latera recta postice convergentia, ac in *Sesarmâ*.  
 G. 3. ERIOCHEIR, De H.† — Articulus maxillipedis externi 3tius ac in *Pseudograpsus*. Frons dimidio latitudinis carapacis multo brevior. Carapax subpolygonatus.  
 G. 4. PLATYNOTUS, De H.‡ — Articulus maxillipedis externi 3tius 2do longior, margine postico valde obliquo.  
 G. 5. TRICHOPUS, De H.§ — Articulus maxillipedis externi 3tius latior quam longus, extus dilatatus. Pedum articuli 5tus 6tusque posticorum compressi denseque ciliati.

2. *Maxillipedes externi rhomboidicè hiantes.*

- G. 6. GRAPSUS, Lamk. — Carapax transversim lineolatus, lateribus plus minusve arcuatis. Frons dimidio latitudinis carapacis brevior. Antennæ externæ juxta frontis latera oblique exsertæ. Tarsi spinulis armati.  
 G. 7. GONIOGRAPSUS, Dana.|| — Carapax transversim lineolatus, lateribus rectis, postice sæpe convergentibus. Frons dimidio latitudinis carapacis longior. Antennæ externæ sub frontis margine sæpius exsertæ. Tarsi spinulis armati.  
 G. 8. PLANES, Leach.¶ — Carapax non lineolatus, lævis, fere quadratus, parce oblongus. Frons rectus. Articulus maxillipedis externi 3tius latior quam longus, cordatus. Tarsi spinulis armati.  
 G. 9. HEMIGRAPSUS, Dana.\*\* — Carapax non lineolatus, fere lævis, lateribus plus minusve arcuatis. Frons rectus aut rectiusculus, antennis internis transversis. Articulus maxillipedis externi 3tius fere orbiculato-cordatus. Tarsi inermes.  
 G. 10. CYRTOGRAPSUS, Dana. — Carapax gibbosus, subhexagonus non lineolatus.

\* Lucas, Expl. de l'Alger, pl. 2, f. 4.

† Faun. Japon., p. 32, 59. — *Utica* of White (Ann. Mag. Nat. Hist., xx. 206, and Crust. Voy. Samarang, 52, pl. 13, fig. 6).

The *E. penicillatus* of De Haan (p. 60, pl. 11, f. 6), appears to be a true *Pseudograpsus*.

‡ Faun. Japon., p. 34.

BRACHYNOTUS is the name of another genus by De Haan, based on a Mediterranean species described by Risso, Hist. Nat. de l'Eur. Merid., v. 13. The male abdomen is but four-jointed, the female seven-jointed; second and third joints of the outer maxillipeds of equal length, and the third truncate at either extremity.

§ Faun. Japon., p. 32. — *Varuna* of Edwards, Crust., ii. 94.

|| In part, *Goniopsis* of De Haan, Faun. Japon., p. 33, and *Pachygrapsus* of Randall, J. Acad. Nat. Sci. Philad., viii. 126.

¶ MS. Mus. Brit.; the genus is recognised in Bowdich's "Madeira and Porto Santo," p. 151; and more lately in Bell's Brit. Crust., p. 133. — *Nautilograpsus* of Edwards, Crust., ii. 89.

\*\* *Grapsus* (subgenus) of De Haan, Faun. Japon., p. 31; *Cyclograpsus*, in part of Edwards, Crust., ii. 77.

Frons sursum sinuosus, antennis internis obliquis, in plicis frontis insitis. Articulus maxillipedis externi 3tius suborbiculato-cordatus. Tarsi inermes.

2. SESARMINÆ. — Antennæ internæ fronte tectæ. Articulus maxillipedis externi 3tius costâ obliquâ in 2dum productâ notatus.

1. *Articulus maxillipedis externi 3tius apice rotundatus.*

- G. 1. SESARMA, *Say.\** — Carapax quadratus, sæpe partim lineolatus, lateribus rectis, fronte rectè prærupto. Abdomen *maris* versus basin sterno contiguo vix angustius. Tarsi sæpe armati.
- G. 2. SARMATIUM, *Dana.* — Carapax subquadratus, lateribus arcuatis, fronte curvatim declivi. Abdomen *maris* versus basin sterno contiguo vix angustius. Tarsi inermes.

2. *Articulus maxillipedis externi 3tius apice truncatus sæpeque excavatus.*

- G. 3. CYCLOGRAPSUS, *Edw.†* — Carapax lævis, medio planus, ad margines anteriores declivis, lateribus arcuatis, integris. Abdomen *maris* versus basin sterno contiguo vix angustius.
- G. 4. CHASMAGNATHUS, *De H.‡* — Carapax convexus, subquadratus, lateribus arcuatis et antice emarginatis, fronte curvatim declivi. Oculi breves. Abdomen *maris* versus basin sterno contiguo parèe angustius.
- G. 5. HELICE, *De H.§* — Carapax quadratus, lateribus parallelis, rectis. Oculi longiusculi. Abdomen *maris* versus basin sterno contiguo multo angustius.
3. PLAGUSINÆ. — Antennæ internæ sinibus frontis longitudinalibus apertæ.

- G. 1. ACANTHOPUS, *De H.||* — Corpus valde depressum. Articulus maxillipedis externi 3tius oblongus, parvus, apice 2di multo angustior. Ramus maxillipedis 1mi internus apice angustus et non transversus.
- G. 2. PLAGUSIA, *Latr.,¶ D.* — Corpus minus depressum, crassius. Articulus maxillipedis externi 3tius apice 2di vix angustius, raro longior quam latus. Ramus maxillipedis 1mi internus apice transversus.

\* Jour. Acad. Nat. Sci., i. 76, 1817. *Pachysoma* of De Haan, Faun. Japon., p. 33.

† Crust., ii. 77. — Gnathochasmus of M'Leay, Smith's Illust. Zool. S. Africa, and Cat. Crust. Brit. Mus., by A. White, 1847, 40.

‡ Faun. Japon., p. 27.

§ Faun. Japon., p. 28.

|| Faun. Japon., p. 29. Corresponds to *Plagusia clavimana*.

¶ Corresponds to *Plagusia* and *Philyra* of De Haan, Faun. Japon., p. 31.



## SUBFAMILY I. GRAPSINÆ.

## GENUS PSEUDOGRAPSUS.

The genus *Pseudograpsus* is very near *Eriocheir* of De Haan; both have the inner margins of the outer maxillipeds nearly parallel, and the third joint round-cordate or subquadrate. But in the figures of De Haan's *Eriocheir Japonicus*, the front is narrower than half the breadth of the carapax, while in our *Pseudograpsi*, it is as wide as half the carapax, or even wider; and again, the form in the *Eriocheir* is more polygonal, and the abdomen appears to be triangular from a rather broad base, hardly narrower than the corresponding part of the sternum and nearly twice as broad as the penult segment, while according to Edwards, the *Pseudograpsi* have the abdomen narrower at base than the sternum or but little broader than the penult segment, and the carapax has arcuate sides. The *Eriocheir Japonicus* is a fresh-water species, and the *Pseudograpsi*, as far as known, are sea-shore species. The *Eriocheir penicillatus* of De Haan probably falls with the *Pseudograpsi*: he does not mention whether it is marine or not. The genus *Utica* of White, appears to be essentially congeneric with *Eriocheir*, judging from the polygonal form and narrowness of the front in the figure by White (Voy. Samarang, Pl. 13, f. 6), although wanting in the bushy hair of the hand.

## PSEUDOGRAPSUS OREGONENSIS.

*Carapax parce areolatus, regione medianâ leviter circumscriptâ, cum lineâ transversâ antice levissimè notatâ, margine præmediano abrupto; fronte sinuoso, margine antero-laterali bi-emarginato, dentibus acutis. Pedes antici læves, manu extus nudâ, infra obsoletè uni-costatâ, intus partim lanosâ, carpo lævi, digitis maris hiantibus. Pedes postici marginibus paulo hirsuti præcipue articulorum 4ti 5tique.*

Carapax sparingly areolate, median region faintly circumscribed, crossed by a faint transverse line anteriorly, præmedian margin abrupt; front sinuous; antero-lateral margin bi-emarginate, teeth

acute. Anterior feet smooth, hand naked externally, below obsoletely uni-costate or hardly so, surface within having a lanose spot, carpus smooth; fingers of *male* gaping and touching only at tips. Posterior feet somewhat hirsute at the margins, especially of fourth and fifth joints.

Plate 20, fig. 6 *a*, animal, natural size; *b*, hand, in outline.

Puget's Sound.—Lieut. Case.

Length of carapax, ten lines; breadth, eleven and a half lines.

*P. oregonensis*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 248.

#### PSEUDOGRAPSUS NUDUS.

*Carapax obsolete areolatus, regione medianâ vix circumscriptâ, cum lineâ elevatâ non intersectâ, areolâ intramedianâ (3 M) non circumscriptâ, fronte paulo arcuato, margine antero-laterali bi-emarginato. Pedes toti nudi; antici æqui, manu extus nudâ, lævi, infra levissimè unicostatâ, intus partim lanosâ, carpo lævi; 8 postici paulo lati, tarso sulcato.*

Carapax obsoletely areolate, median region hardly circumscribed, not crossed by a raised line, areolet 3 M (intramedian), not circumscribed; front slightly arcuate, antero-lateral margin bi-emarginate. Feet all naked; anterior equal, hand naked and smooth without, faintly uni-costate towards lower part, within over a spot lanose, carpus smooth; eight posterior feet compressed, tarsus sulcate, compressed.

Plate 20, fig. 7 *a*, male, natural size; *b*, under view; *c*, hand, natural size.

Puget's Sound and San Francisco.—C. Pickering.

Length of carapax of a female, ten and a half lines; greatest breadth, twelve and a half lines; ratio, 1:1.19; length of a male,



ten and two-thirds lines; breadth, twelve and one-third lines; ratio, 1:1.16; length of another male, twelve and three-fourths lines; breadth, fourteen and one-tenth lines; ratio, 1:1.11. The colour is dark or light brown, or brownish red, with the hand coarsely dotted with colour. The median region is smooth, and shows its limits distinctly behind, and also on the front of the præmedial areolet and the front of the outer part of the extramedial, behind the eyes, but the limit is very faintly discerned elsewhere; the intramedial areolet is not distinct except in its posterior outline. The front is slightly impressed at middle. The tarsi have two sulci either side, and one above, and the dorsal surface is scabrous, the lateral less so.

*P. nudus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 249.

GENUS TRICHOPUS, *De Haan*.

TRICHOPUS LITTERATUS (*Fabr.*), *De Haan*.

Plate 20, fig. 8 *a*, male, natural size; *b*, abdomen and sternum.

At sea, fifty miles southwest of west entrance of Straits of Sunda, found on a floating piece of bamboo.

*Cancer litteratus*, FABR., Supp., 342; HERBST, iii. 58, pl. 48, f. 4.

*Trichopus litteratus*, DE HAAN, Faun. Japon., Crust., 32.

*Varuna litterata*, EDWARDS, Crustacés, ii. 95, pl. 14bis, f. 8.

GENUS GRAPSUS.

In Grapsus, the sides of the carapax are arcuate, the surface more or less lined transversely, the front shorter than half the breadth of the body, and the tarsi spinulous below. The third joint of the outer maxillipeds may be either oblong or as broad as long.

GRAPSUS PICTUS, *Latreille*.

Plate 21, fig. 1, outer maxillipeds.

Island of Madeira; Cape Verds; San Lorenzo, Peru; Vincennes, and other islands of Paumotu Archipelago; Sandwich Islands.

We have given a figure of the outer maxillipeds for comparison with the same organs in the *G. cruentatus*. The approximation is so close, that on this ground, only the smallest specific distinction could be drawn. In this species the vertical front is about twice as long as its height. The bend in the front of the carapax takes place at the front margin of the præmedial areolets, and the projecting lobes are the fronts of these areolets; in the specimens from Madeira they are nearly entire. Length of front, seven lines; height, three lines. In young specimens the front is less vertical, being inclined at about  $120^\circ$ , and there is something of a crest on the epistome either side; the hand also is smoother outside, and the lower apex of the third joint of the third and fourth pairs of legs is but two-toothed. Such are specimens from the Sandwich Islands.

In a large specimen from San Lorenzo, the third joint of the eight posterior legs enlarges towards the apex, where it is broadest, instead of being broadest about the middle, as in the common variety of the *pictus*. The front is quite vertical, and hardly twice as long as it is high, and rather broader above than below. The front of the præmedial areolets, either side of the middle, is two or three-dentate. The process separating the orbit from the antennæ is much elongated, so as to reach quite as far forward as the front. Both this and the preceding have the lower apex of the third joint of the posterior legs entire and rounded. The hand has the costa near lower side made up of granules.

Length of carapax, two and a half inches; breadth, two and three-fourths inches; ratio, 1:1.1; length of front (across middle), twelve lines; height of front, five and a half lines.

The colours vary between deep brownish black and orange-yellow, in irregular transverse lines, much interrupted. They are more finely broken up in the Madeira specimens than in those of Peru.

*Grapsus pictus*, LATR., Hist. Crust., vi. 69; EDWARDS, Crust., ii. 86, and Cuv., pl. 22, f. 1.

*Goniopsis pictus*, DE HAAN, Fauna Japonica, 33.



GRAPSUS STRIGOSUS (*Herbst*), *Latreille*.

Plate 21, fig. 2, outer maxillipeds, natural size.

Valparaiso, Chili.

Length of carapax of a male, two inches; breadth, two inches and two lines; length of front, ten and a half lines; height, three lines. The front is quite different in proportions from the *pictus*, and corresponds with the shorter epistome. The third joint of the posterior legs (like that of the other legs), in our specimens and in *Herbst's* figure, is three-dentate at its lower apex, instead of entire, like *pictus*. The inner oblong acute process to carpus is narrow and thorn-like. The præmedial front projects prominently over the surface below. The fifth joint of the eight posterior legs is short, or less than three times its length. The third joint of the second pair of legs is but little shorter than that of the third pair—about one-fifth shorter. The angle between the line of the back and the front is  $120^{\circ}$  to  $130^{\circ}$ . The process (in our specimen) between the orbit and the antennæ is quite long and oblique, reaching as far as the front.

*Cancer strigosus*, HERBST, pl. 47, f. 7.

*Grapsus strigosus*, LATREILLE, Hist. Crust., vi. 70; EDWARDS, ii. 87.

*Goniopsis strigosus*, DE HAAN, Faun. Japon., 33.

## GRAPSUS PLANIFRONS.

*Nudus. Frons fere horizontalis, sat latus. Margo carapacis lateralis bene arcuatus, antero-lateralis bi-emarginatus. Epistoma brevissimum. Articulus maxillipedis externi 3tius vix longior quam latus. Pedes antici sat crassi, manu supra pustulatâ, extus infraque lævi; brachio apicem anticum 5-6-denticulato. Pedes 8 postici valde compressi, articulo 3tio pedis postici ad apicem inferiorem integro, articulo penultimo supra scabro.*

Naked. Front nearly horizontal, rather broad; lateral margin of

carapax arcuate, antero-lateral bi-emarginate. Epistome very short. Third joint of outer maxillipeds as long as broad. Anterior feet rather stout; hand above small pustulate, externally and below smooth; arm with five or six teeth at anterior apex. Eight posterior feet much compressed, third joint of posterior pair entire at inferior apex; penult joint scabrous above.

Plate 21, fig. 3 *a*, animal, natural size; *b*, abdomen and sternum of male; *c*, outer maxillipeds, natural size; *d*, hand, natural size; *e*, spine of tarsus.

Valparaiso, Chili; Callao, Peru.

Length of carapax, seventeen and one-third lines; breadth, nineteen lines; length of front, six and three-fourths lines; breadth of front to front of præmedial areolets (which but slightly project), two and one-fourth lines. Colour, finely lined and spotted irregularly with brownish black or black, with intervening spaces a little yellowish.

Sides of carapax much arcuate. The species is near *G. variegatus*; but according to Edwards's description of that species, and the figure in Guerin's "Iconographie," it has the third joint of the outer maxillipeds much oblong, while in this species, the joint is not longer than broad.

The figure in the Voy. de l'Uranie, under Freycinet, pl. 76, f. 2, may be this species.

*G. planifrons*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 249.

#### GRAPSUS LONGITARSIS.

*Carapax nudus, regione medianâ granulatus, fronte abrupto, perangusto, lateribus parce arcuatis, margine antero-laterali 1-emarginato. Articulus maxillipedis externi 3tius vix oblongus. Epistoma breve, utrinque acutè cristatum. Pedes antici sat parvi, manu carpoque supra parce granulatis, manu extus fere lævi, infra leviter costatâ. Pedes postici nudi; tarso elongato, spinulis dorsi multo brevioribus.*

Carapax naked, median region granulate, front abrupt, very narrow,



sides little arcuate, antero-lateral margin one-emarginate. Third joint of outer maxillipeds hardly longer than broad. Epistome short, acutely cristate either side. Anterior feet rather small, hand and carpus above sparsely granulous, hand externally very nearly smooth, towards lower side faint costate. Posterior feet naked; tarsus long, dorsal spines much shorter than those below.

Plate 21, fig. 4 *a*, male, natural size; *b*, under view, four diameters; *c*, hand, natural size; *d*, outline of arm.

Paumotu Archipelago.

Length of carapax, nine and a half lines; breadth, ten and three-fourths lines; length of front, five lines, and breadth (to præmedials), hardly a line. The third joint of the outer maxillipeds is short, as in the *planifrons*; but the front is abrupt and very narrow, and there is but one emargination in the antero-lateral margin. The tarsus is quite long, and has a neater or more naked aspect than usual, from the shortness of the dorsal spinules; and there is a densely ciliate line near dorsal margin.

The third joint of the last pair of legs is three or four-denticulate at the inferior apex. The postero-lateral surface of carapax is strongly lined transversely.

*G. longitarsis*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 249.

#### GRAPSUS LIVIDUS, *Edwards*.

Plate 21, fig. 5 *a*, male, natural size; *b*, outer maxillipeds, enlarged two diameters; *c*, hand, natural size.

Island of San Lorenzo, Peru.

Length of carapax, eleven lines; breadth, thirteen and a half lines; length of front, five and a half lines, and breadth (to præmedials), about one line. Colour, mostly dark chestnut-brown, in transverse linings. The carapax is naked and smoothish, nearly square, the sides being sparingly arcuate anteriorly, front abrupt. Anterior feet nearly

equal, carpus, hand, and upper finger neatly granulous above, hand externally smooth or nearly so and not costate, arm at anterior margin about five-dentate. Posterior feet broad, fourth and fifth joints and tarsus with the margins long and sparingly hairy. The third joint with a spiniform seta at apex and no tooth; tarsus rather stout and tapering.

The posterior margin of the epistome bordering the buccal area is very nearly straight, and even with the level of the outer maxillipeds, and nine or ten denticulate. Third joint of outer maxillipeds oblong. Inner margin of third joint naked, except at base. The pterygostomian region is pubescent. There is a distinct and deep emargination at the outer extremity of the orbit.

## GRAPSUS CRINIPES.

*G. livido affinis.* Carapax nudus, sublævis, fere quadratus, fronte sat abrupto, margine antero-laterali 1-emarginato. Pedes antici fere æqui, carpo manu digitoque mobili superne granulatis, manu extus fere lævi, nec costatâ; brachio ad apicem anticum 5-7-denticulato. Pedes postici sparsim criniti, articulo tertio lato, tarso perangusto, lineari, paulo curvato. Margo epistomatis posticus valde arcuatus.

Near *G. lividus*. Carapax nude, nearly smooth, subquadrate, front rather abrupt, antero-lateral margin with one emargination. Anterior feet nearly equal, carpus, hand, and moveable finger granulous above, hand externally nearly smooth and not costate; arm with five to seven teeth at anterior apex. Posterior feet sparsely long, hairy, third joint broad, tarsus very narrow and not at all tapering. Posterior margins of epistome much arcuate.

Plate 21, fig. 6 *a*, outer maxillipeds, enlarged two diameters; *b*, outline of part of arm, natural size; *c*, leg of fourth pair, enlarged two diameters; *d*, hand of female, natural size.

Sandwich Islands.

Length of carapax of female, nine and three-fourths lines; breadth, eleven and a half lines; length of front, four and three-fourths lines;



breadth of third joint of fourth pair of legs, four lines; breadth of fifth joint, two and three-fourths lines, or less than half the third; breadth of tarsus at base, four-fifths of a line. This species is very near the *lividus*, and is in most points very well represented by the figure of that species. But the tarsus and the two preceding joints are very much more slender; the epistome has not a straight margin behind, but curved, as in figure 6a; the emargination at the outer extremity of the orbit is very shallow; the third joint of the outer maxillipeds is similarly oblong, but has a few unequal hairs along the whole length of the inner margin; the striæ of the carapax and legs are much shallower. The pterygostomial region is pubescent; the front nearly vertical; the posterior apex of third joint of fifth pair of legs entire.

*G. crinipes*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 249.

#### GENUS GONIOGRAPSUS, Dana.

*Carapax multis lineis transversim notatus, subquadratus, lateribus rectis, sive parallelis sive postice convergentibus. Frons dimidio latitudinis carapacis longior. Antennæ externæ sub fronte sæpius exsertæ. Tarsi armati.*

Carapax crossed transversely by numerous raised lines, subquadrate, sides straight, often convergent backwards. Front longer than half the breadth of the carapax. Outer antennæ usually exsert from beneath the front. Tarsi armed with spinules.

The remarks on page 330 render farther explanations unnecessary. We only add, that while the Grapsi live mostly about the rocks in the surf, the Goniograpsi are found to some extent about salt marshes, as well as in shallow and deep waters.

#### GONIOGRAPSUS CRUENTATUS.

Plate 21, fig. 7, male, natural size.

Rio Janeiro, in salt marshes.

The length of carapax of a male, nineteen lines; breadth, twenty-two and a half lines; length of a female, eighteen lines; breadth, twenty-two and a half lines; length of front in male, twelve lines, and breadth to angle, two and a half lines. The colour of the carapax is olive-green, finely lined or mottled, and posteriorly, yellowish with green dottings,—it becomes red on dying; legs cherry-red, with a few large ocelli, having a white centre and brown border, upon the sides of the coxæ. The antero-lateral margin has a single emargination. The hand, carpus, and moveable finger are small spinulose above.

*Grapsus cruentatus*, LATR., Hist. Crust., vi. 70; EDWARDS, ii. 85.

*Goniopsis cruentatus*, DE HAAN, Faun. Japon., 33.

*Grapsus longipes*, RANDALL, Jour. Acad. Nat. Sci. Philad., viii. 125.

#### GONIOGRAPSUS PLICATUS (*Edw.*), *D.*

Sandwich Islands.

Length of carapax, nine and a half lines; breadth, twelve lines; length of front, seven and a half lines, and breadth to præmedials, about one line. The linings of this species are peculiarly salient over the surface, and are minutely ciliate. The antero-lateral margin has no emargination. The hand and carpus are granulous above, and the hand is costate on its outer surface. The third joint of the posterior legs has the lower apex three or four toothed, but no other teeth on the lower margin; and there is only one above, and that near apex. The longest spinules of the tarsus are those on the upper side towards apex. The fourth and fifth joints of the eight posterior legs are very thinly hairy. The third joint of the outer maxillipeds is a little longer than broad. This is a very thick species, with a high, steep front, the vertical part rounding into the back, the front of the præmedial areolet bending down nearly to the margin, instead of stopping at the angle.

*Grapsus plicatus*, EDWARDS, Crust., ii. 89.

*Grapsus plicatus?* KRAUSS, Südafrikanischen Crust., pl. 3, f. 1.

From the dentations on the third joint of the posterior legs of Krauss's species, on both margins, we judge that his species must be a different one—and it may be called *Goniograpsus Kraussii*.



GONIOGRAPSUS THUKUJAR, *Owen*.

Sandwich Islands; Feejee Archipelago; Samoan Islands.

Length of a female, ten and a half lines; breadth, thirteen lines; length of the front, eight lines. Surface nearly smooth. Front bends downward rather abruptly, and becomes nearly vertical. Sides converge somewhat backward. Antero-lateral margin entire. Third joint of the posterior legs with three small teeth at the lower apex. Hand and carpus slightly rugate above, but the outer surface of the hand smooth, with a single raised line near its lower side. Third joint of outer maxillipeds not longer than broad.

*Grapsus Thukujar*, OWEN, Crust. Blossom, 80, pl. 24, f. 3.

*Pachygrapsus parallelus*, RANDALL, Jour. Acad. Nat. Sci. Philad., viii. 124.

## GONIOGRAPSUS VARIUS?

Rio Janeiro?

The species here referred, has the front projecting and nearly horizontal, as in the *varius*, and there are two emarginations in the antero-lateral margin. Sides hardly converge backward. Hand smooth outside, and slightly margined above; carpus minutely rugate. Fourth and fifth joints of eight posterior legs sparsely hairy; third joint of last pair entire and rounded at lower apex. Fourth joint of the outer maxillipeds articulated with third, near middle of summit margin. The specimen is a small one, but five lines broad; length of front, three lines.

*Grapsus varius*, LATREILLE, Hist. Crust., vi. 67; EDWARDS, Crust., ii. 88.

## GONIOGRAPSUS SIMPLEX.

*Vario similis*. Carapax fere quadratus, lateribus postice vix convergentibus, fronte paulo declivi, parce sinuoso, margine antero-laterali

1-emarginato. *Carpus supra minutè rugatus; manus extus lævis, supra paulo rugata. Articuli 4tus 5tusque pedum 8 posticorum sparsim hirsuti; 3tius pedis postici apice inferiore truncatus, integer, pedis 4ti 3tiive 2-3-dentatus.*

Near *varius*. Carapax subquadrate, sides hardly convergent backward, front a little inclined and slightly sinuous, antero-lateral margin one-emarginate. Carpus above minutely rugate; hand smooth externally, slightly rugate above. Fourth and fifth joints of feet sparsely hairy; third joint of last pair truncate at lower apex, entire, of third and fourth pairs two or three-toothed.

Plate 21, fig. 8 *a*, outline of carapax, enlarged two diameters; *b*, leg of fifth pair, enlarged four diameters.

Rio Janeiro?

Length of carapax, four lines; breadth, four and three-fourths lines; length of front, two and three-fourths lines. The antero-lateral margin has a single emargination, as in the *crassipes* of Randall, J. Acad. Nat. Sci., viii. 127; but that species, according to Dr. Randall, has "the front considerably depressed, with four rounded lobes above, all very convex, and resembling great tubercles,"—but in this species, the two outer of these lobes are faint, and the two inner are low, and could hardly be compared to tubercles. The body, moreover, is rather thin instead of stout. The arm in the *crassipes*, has the inner apex very much dilated and projecting, with the projection truncate.

*G. simplex*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 249.

#### GONIOGRAPSUS INNOTATUS.

*Carapax fere quadratus, lateribus postice convergentibus, fronte sat declivi, margine antero-laterali 1-emarginato, lineis transversis carapacis subtilissime crenulatis. Carpus supra lævis; manus supra extusque lævis; brachium apice 2-3-dentatum. Articulus pedis postici tertius apice inferiore 3-dentatus.*



Carapax nearly quadrate, sides converging, front considerably inclined, antero-lateral margin one-emarginate, transverse lines of carapax very minutely crenulate. Carpus smooth above; hand smooth above; arm two to three-toothed at apex. Third joint of posterior feet three-toothed at lower apex.

Plate 21, fig. 9 *a*, male, natural size; *b*, outer maxillipeds, enlarged two diameters; *c*, hand, natural size.

Locality uncertain; probably from the South American coast.

Length of carapax of a male, seven lines; breadth, nine lines; length of front, five and one-fourth lines. Near the *simplex*, but differs in having the sides convergent, the lower apex of third joint of last legs denticulate, and the carpus smoother. Also, the first joint of the outer antennæ is long linear transverse, and the process just inside of it, reaching down from the front, is broad and truncate below; the basal joint extends farther inward towards the medial line than the inner side of this process. Third joint of outer maxillipeds not longer than broad.

*G. innotatus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 249.

#### GENUS PLANES, *Leach*.

#### PLANES MINUTUS (*Fabr.*)

Gulf-weed, Atlantic.

This long-known species has usually a dull yellowish colour, clouded with brownish yellow. The male abdomen is quite regularly triangular, with an obtuse apex, and the greatest breadth more than two-thirds its length; the third joint is not abruptly broader than the following, but instead, the sides from the third joint are regularly converging. The upper margin of the fourth and fifth joints of the eight posterior legs is rather densely ciliate.

*Cancellus marinus minimus quadratus*, SLOANE, Jamaica, xi. pl. 245, f. 1.

*Cancer minutus*, FABRICIUS, Ent. Syst., xi. 443, and Supp., 343.

*Grapsus minutus*, LATREILLE, Hist. Nat. des Crust., vi. 68.

*Nautilograpsus minutus*, EDWARDS, ii. 90; GOODSIR, Ann. Mag. N. H., xv. 73.

*Grapsus cinereus*, SAY, Jour. Acad. Nat. Sci. Philad., i. 99.

## PLANES CYANEUS.

*Pedes octo postici valde compressi, articulis tribus ultimis extus dense villosociliatis. Abdomen maris angustè triangulatum, duplo longius quam latum, 7-articulatum, articulo tertio latiore, breviorè quam quartus, ultimo triangulato.*

Eight posterior feet much compressed, last three joints densely ciliate on outer margin. Abdomen of *male* narrow triangular, about twice as long as broad, third segment broadest, but shorter than fourth, last triangular.

Plate 22, fig. 1 *a*, animal, natural size; *b*, under view; *c*, exterior antennæ; *e*, tarsus of fourth pair of legs; *f*, male abdomen; *g*, female abdomen.

Very abundant in the Pacific, latitude 28° north, longitude 174° east; May 18, 1841. A similar animal taken in south latitude 15° 50', longitude 105°, July 26, 1839. No sea-weed in these seas.

Colour, cerulean blue. Eyes same, but paler. Length, one-half to two-thirds of an inch.

The specimen figured was from 28° north latitude. The carapax is smooth and but little shining. The lateral margin has an obsolescent border. Third and fourth pairs of legs somewhat longer than first or second pair. Greatest breadth of male abdomen, about half the length; of female abdomen, three-fourths the length. The antennæ are situated as shown in the figure; the exterior pair has a very stout angular base. The exterior maxillipeds have the third joint about half as long as second; the second is slightly arcuate within.

The specimen obtained south of the equator was very similar to the above. The description drawn up at the time does not include any point of difference; the drawing made, however, represents the female abdomen very nearly orbicular, or scarcely longer than broad (fig. 1 *h*), which may depend on age. The length is equal to the breadth, and the carapax was smooth and shining. Fig. 1 *i* represents the exterior maxillipeds.



The male abdomen is so different in shape from the *minutus*, and the colour also, so unlike, that we believe the two to be different species.

*P. cyaneus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 250.

GENUS HEMIGRAPUS, Dana.

*Carapax fere lævis, lineis transversis non notatus, fronte fere recto, lateribus arcuatis. Maxillipedes externi rhombicè hiantes, articulo 3tio orbiculato-cordato. Antennæ internæ transversæ.*

Carapax nearly smooth, not marked by transverse lines, front nearly straight, sides arcuate. Outer maxillipeds separated by a large rhomboidal space, third joint orbiculato-cordate. Inner antennæ transverse.

Hemigrapsus includes part of the species referred to Edwards's Cyclograpsus, as explained on page 331. The process outside of the outer antennæ is transverse, triangular, and sets closely against the first joint of the antennæ. The abdomen of the male is rather narrow, and at base it does not quite reach to base of posterior legs. Carpus rounded on inner side. Part of De Haan's Grapsi belong to this genus.

HEMIGRAPUS SEXDENTATUS (*Edw.*), Dana.

Plate 22, fig. 2 *a*, male, natural size; *b*, leg of second pair, *ibid.*; *c*, leg of fifth pair, *ibid.*

Bay of Islands, New Zealand.

Length of carapax, nine lines; breadth, ten lines; length of front, four and two-thirds lines. Colour of back, dark brown to black clouded with gray, or dirty white; legs black, clouded or banded with dirty white. Front considerably inclined, straight; antero-lateral margin two-emarginate, teeth triangular, subacute. Legs naked,

tarsus rather stout and unarmed. Hands very nearly equal, smooth, but not shining, a slightly raised horizontal line below on outer surface, running into lower finger.

*Cyclograpsus sexdentatus*, EDWARDS, Crust., ii. 79.

#### HEMIGRAPUS CRENULATUS (*Edw.*), *Dana*.

Plate 22, fig. 3 *a*, hand, natural size; *b*, leg of second pair, *ibid.*; *c*, leg of fifth pair, *ibid.*; *d*, abdomen, *ibid.*

Bay of Islands, New Zealand.

The specimens referred to this species, are similar in the front and antero-lateral margin to the *sexdentatus*. The teeth are triangular and nearly acute. But the tarsi are much more slender, and the margins of both these and the other joints of the eight posterior legs (including upper margins of third joint), are somewhat hirsute. The hand and carpus are smooth. The surface of the carapax in both species is fine granulous.

Length of carapax of a male, nine and a half lines; breadth, eleven lines; length of the front, five lines.

*Cyclograpsus crenulatus*, EDWARDS, Crust., ii. 80.

#### HEMIGRAPUS CRASSIMANUS.

*Carapax subtiliter granulatus, margine antero-laterali leviter 2-emarginato, dentibus brevissimis et rotundatis, etiam emarginatione tertiâ obsolete. Pedes maris antici crassi, nudi, carpo supra indentato. Pedes sequentes tenues, articulo tertio supra fere nudo, infra lanoso, reliquis margines plerumque pubescentibus, quinto supra sulcato, tarso gracili. Abdomen maris perangustum, articulo ultimo angustè elongato.*

Carapax very fine granulate, antero-lateral margin slightly two-emarginate, teeth very short, rounded; also, a third obsolete emargination. Anterior feet of *male* stout, naked, carpus indented above.



Following feet slender, third joint nearly naked above and lanose below, the following joints with the margins mostly pubescent, fifth sulcate above, tarsus slender. Abdomen of *male* very narrow, last joint narrow elongate.

Plate 22, fig. 4 *a*, male, enlarged two diameters; *b*, abdomen and sternum of male; *c*, outer maxillipeds, enlarged four diameters; *d*, leg of second pair, enlarged two diameters.

Sandwich Islands.

Length of carapax, six and one-fourth lines; breadth, six and three-fourths lines; length of front, two and three-fourths lines. The hands have a narrow flattened space along the top, and the carpus an indentation in the upper surface. The third joint of the second and third pairs of legs is very densely hairy below, and the same joint of the fourth pair is somewhat less so, and the fifth joint is also nearly as densely hairy below. The last joint of the male abdomen is hardly larger at base than above, being linear nearly in form. The lateral margin has a third obsolescent emargination, behind the two which are more distinct, nearer the second than the second to the first. The fifth joint of the last pair of legs, is much more hairy on both margins than in the other pairs. From the extremity of the lower finger, on its inner and upper side, there is a crenulate line extending towards its base; and a similar line less distinct on the upper finger.

*H. crassimanus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 250.

#### HEMIGRAPsus AFFINIS.

*H. crassimano fermè affinis. Manus maris crassa, minus tumida, antice paulo compressa, digitis liantibus. Articulus pedis 2di 3tii 4tive tertius infra villosus, supra partim pubescens. Pes 5tus articulis 4to 5to 6toque infra supraque pubescens. Margo carapacis antero-lateralis 3-emarginatus, emarginationibus duabus posticis parvulis.*

Very near *H. crassimanus*. Hand of *male* stout, but less tumid and somewhat compressed towards fingers, fingers gaping. Third joint

of second, third, or fourth pair of legs villous below, and in part pubescent above. Fifth pair pubescent above and below, on fourth, fifth, and last joints. Antero-lateral margin of carapax three-emarginate, two posterior emarginations quite small.

Plate 22, fig. 5 *a*, hand of male, natural size; *b*, leg of second pair, *ibid.*; *c*, leg of fifth pair, *ibid.*; *d*, part of outer maxilliped; *e*, abdomen and sternum.

Rio Negro, Northern Patagonia.

Length of carapax, seven lines.

*H. affinis*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 250.

#### GENUS CYRTOGRAPSUS.

*Carapax fere octagonus, angulatè gibbosus, fronte angusto, margine super antennis internas prominenter reflexo, eoque his antennis valde obliquis et non transversis. Maxillipedes externi rhombicè hiantes, articulo 3tio subtriangulato, vix angustiore quam longo.*

Carapax nearly octagonal, angulately gibbous, the part of the front over the inner antennæ reflexed, and these antennæ, therefore, nearly longitudinal, or very oblique instead of transverse. Outer maxillipeds with a broad rhomboidal interval, third joint subtriangular, hardly narrower than long.

The angular aspect of the species is peculiar, and especially the front, which in a front view is very sinuous, the part over the inner antennæ being arched upward so as to afford space for the base of these antennæ in a nearly longitudinal position. The antero-lateral margin is four-dentate; from the last tooth a sharp ridge proceeds inward and slightly backward. The anterior legs are stout in the male, and quite small and weak in the female. The outer antennæ have the first joint very short and not reaching to the front, or nearly so, as in *Hemigrapsus*; on the contrary, the first and second joints together reach the front. The length of the front is not over a third of the breadth of the carapax.



The name of this genus is from the Greek *κυγτος*, *gibbous*, and *Grapsus*.

CYRTOGRAPSUS ANGULATUS.

*Carapax angulato-gibbosus, granulatus, nudus, margine antero-laterali fere recto, 4-dentato, margine postero-laterali leviter uni-dentato. Pedes maris antici crassi, granulati, manu supra paulo truncatâ, carpo intus truncato. Pedes 8 postici fere nudi, valde compressi, margine articuli 3tii superno subacuto, articulo 5to supra sulcato, tarso sulcato.*

Carapax angulato-gibbous, granulous, naked, antero-lateral margin nearly straight, four-toothed, postero-lateral one-toothed. Anterior feet of *male* stout, granulous, hand somewhat flattened above and carpus flattened on inner side. Eight posterior feet nearly naked, much compressed, upper margin of third joint subacute, fifth joint sulcate above, tarsus sulcate.

Plate 22, fig. 6 *a*, male, natural size; *b*, under view, *ibid.*; *c*, front view of front; *d*, sternum and abdomen, *ibid.*; *e*, hand, natural size, *ibid.*

Rio Negro, Northern Patagonia.

Length of carapax of a male, seventeen and three-fourths lines; breadth, twenty-one lines; length of front, six lines; breadth between the post-orbital teeth, twelve and a half lines. In the male, the ridge extending inward from the lateral tooth is rather sharp and the carapax where it terminates is rounded prominent; the cardiac areolet is well defined and separated by a deep suture from the preceding; the intra-medial areolet is also well pronounced.

*C. angulatus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 250.

## SUBFAMILY II. SESARMINÆ.

GENUS SESARMA, *Say*.1. *Margo antero-lateralis emarginatus*.SESARMA BIDENS (*De Haan*).

Feejee, or Friendly Islands.

Length of carapax of a male, ten lines; breadth in front, twelve lines. The breadth diminishes slightly posteriorly. The surface is shining, and there are some interrupted transverse lines on the carapax anteriorly. The upper finger is obtuse and crenulate above; the hand is very short at its upper inner edge, and this edge rises into two dentations, which dentations are continued upon the surface outward in a raised line, which is surmounted by a minute pectinate crest of a dark or horn-like colour. The hand is scattered granulous; the carpus is also granulous, but the granules are partly in short lines. The third joint of the eight posterior legs is very broad, and the fifth joint has a few tufts of short stiff hairs about its margins, besides a very short ciliation of the upper margin, which extends also a short distance upon the fourth joint. The greatest breadth of the male abdomen is less than twice the breadth of the penult joint.

2. *Margo antero-lateralis integer*.

## SESARMA ANGUSTIPES.

*Carapax quadratus, postice parce latior, granulatus, non nitidus, regione postero-laterali leviter lineolatâ, margine antero-laterali integro, lateribus bene marginatis, fronte perpendiculari, supra 4-lobato, margine frontali medio vix excavato. Epistoma granulatum. Pedes antici subæqui, carpo manu digitoque superiore granulatis, granulis nunquam seriatis, manu superné integrâ. Pedes 8 postici angusti, fere*



*nudi, articulo 3tio triplo longiore quam lato, 5to supra non pubescente, infra partim breviter pubescente, tarso elongato, spinuloso.*

Carapax quadrate, rather broader behind, granulate, not shining, postero-lateral region faint lineolate, sides with an acute margin, antero-lateral margin entire, front perpendicular, above four-lobed, frontal margin very slightly excavate at middle. Epistome granulate. Anterior feet subequal, carpus, hand, and upper finger granulate, granules not seriate, hand entire above. Eight posterior feet narrow, nearly naked, third joint three times as long as broad, fifth not pubescent excepting somewhat so below, tarsus elongate and spinulous.

Plate 22, fig. 7 *a*, male, natural size; *b*, male abdomen and sternum; *c*, hand, natural size.

South America.

Length of carapax of a male, nine lines; breadth at middle, nine and a half lines; in front, nine and one-fourth lines; length of front, five and one-third lines; length of hand below base of moveable finger, two and a half lines; length of moveable finger, four and three-fourths lines, but it appears less in a vertical view, as it passes very obliquely downward when closed. The carapax has the intramedial areolet very distinct. The sides have an acute edge, which extends from the front angle to the posterior margin of the carapax.

The species differs from the *hamatochir* of De Haan, which also has a narrow third joint to the eight posterior legs, in having shorter fingers, and the fourth and fifth joints of the eight posterior legs not hairy above. The epistome is not smooth as in the *quadratus*.

#### SESARMA TRAPEZIUM.

*Carapax quadratus, paulo transversus, posticè sensim multo angustior, granulatus, regione laterali lineolatâ, margine antero-laterali integro, fronte perpendiculari, supra leviter 4-lobato, infra leviter arcuato, medio non excavato. Epistoma granulatum. Pedes antici mediocres, granulati, manu brevi, supra non dentatâ, seriatim subtilissimè granu-*

*latâ, digito mobili infra versus basin dense pubescente. Pedes postici valde compressi, articulo 3tio sat lato, 4to 5toque supra pubescentibus. Abdomen maris angustum.*

Carapax quadrate, somewhat transverse, considerably narrower behind, granulate, lateral region marked with raised lines, antero-lateral margin entire, front perpendicular, above faintly four-lobed, below very slightly arcuate and not excavate at middle. Epistome granulate. Anterior feet of moderate size, granulate, hand short, not dentate above, but having series of minute granules; moveable finger with a dense hairy spot below near base. Posterior feet much compressed, third joint rather broad, fourth and fifth pubescent above. Abdomen of male narrow.

Plate 22, fig. 8 *a*, male (mutilated), natural size; *b*, hand, enlarged three diameters; *c*, leg, enlarged three diameters; *c'*, same, natural size.

Sandwich Islands.

Length of carapax of a male, 5½ lines; breadth in front, 7·1 lines; breadth behind, 5·9 lines; length of front, 5 lines. The front is quite long. The surface of the carapax is a little uneven, and anteriorly, as seen with a lens, the granules are sometimes in short series. The third joint of the eight posterior legs is not hairy above. The hairy tuft on the inner surface of the moveable finger near its articulation is short.

#### SESARMA OBTUSIFRONS.

*Carapax quadratus, sat transversus, posticè paulo angustior, omnino bene granulatus, lateraliter nec lineolatus, granulis sparsis, paulo areolatus, margine antero-laterali integro, fronte perpendiculari, supra rotundato, margine frontali arcuato. Epistoma granulatum. Pedes antici mediocres, carpo manique supra granulatis, manu extus lævi, digitis nudis. Pedes postici granulati, articulo 5to brevissimè sparsim hirsuto, 4to fere nudo.*

Carapax quadrate, more transverse than usual, a little narrower behind,



throughout with prominent granules, and with no lines on the lateral regions, granules scattered and distinct, surface rather distinctly areolate, antero-lateral margin entire, front perpendicular, but rounding above into back, frontal margin arcuate. Epistome granulate. Anterior feet of moderate size, carpus and hand granulate above, outer surface of hand smooth, fingers naked. Posterior feet granulate, fifth joint very short and scattered hirsute, fourth nearly naked.

Plate 22, fig. 9 *a*, animal (mutilated), enlarged two diameters; *b*, front view of front; *c*, outer maxilliped, enlarged; *d*, hand, enlarged.

Island of Maui, Sandwich Islands.

Length of carapax, three lines; breadth, anteriorly four lines; posteriorly, three and a half lines. In another specimen, length, four lines; breadth anteriorly, five and one-fourth lines; breadth posteriorly, four and one-fourth lines. The breadth begins to diminish a short distance back of the anterior angles. The distinctness of the granules and their even distribution over the whole carapax give it a neat look. The front has not the usual right angle at its connexion with the dorsal surface, but rounds into this surface; its surface above is four-lobate, or raised into four low rounded elevations. The intra-medial areolet is very distinct, and there is an impressed line running inward and obliquely backward from the anterior part of the lateral margin. But the usual oblique lines posterior to this, either side, are not distinct.

*S. obtusifrons*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 250.

#### SESARMA OBESUM.

*Carapax crassus, quadratus, parce areolatus, posticè vix angustior, punctatus, non nitidus, lateribus ferè arcuatis, nulla parte acutis, margine antero-laterali integro; fronte perpendiculari, supra fere recto, infra bene arcuato. Epistoma granulatum. Pedes antici breves, manu brevi, non granulata, supernè integrâ et brevi. Pedes 8 postici angusti, articulo 4to non hirsuto, 5to sparsim breviter hirsuto, tarso breviter hirsuto.*

Carapax stout, very slightly areolate, quadrate, anteriorly very slightly narrower than near middle, the sides almost arcuate, in no part with an acute edge, antero-lateral margin entire, front perpendicular, line above nearly straight, margin below regularly arcuate. Epistome granulate. Anterior feet short, hand short, not granulous, above entire and short. Eight posterior feet narrow, fourth joint not hirsute above, fifth with some very short hirsute tufts, tarsus very short hirsute.

Plate 22, fig. 10 *a*, male, natural size; *b*, male abdomen and sternum, enlarged two diameters; *c*, hand, natural size.

Straits of Balabac.

Length of carapax, six lines; breadth, six and three-fourths lines. Body thicker than usual, and peculiar in having no acute margin, but rounded sides, except close to the anterior angles. The front is vertical, and the vertical surface flat; the margin above is nearly straight, the usual prominences being but slightly indicated.

*S. obesum*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 250.

#### GENUS SARMATIUM, Dana.

*Carapax longitudinaliter convexus, fronte sat brevi (latitudine carapacis duplo brevior), curvatim declivi, lateribus arcuatis. Articulus maxillipedis externi 3tius subellipticus, apice rotundatus, 2do vix brevior. Abdomen maris 7-articulatum, articulo 2do sternum posticum usque ad latera vix omnino tegente.*

Carapax longitudinally convex, front short, eurvately inclined, sides arcuate. Third joint of outer maxillipeds subelliptical, rounded at apex. Second joint of male abdomen not covering the corresponding parts of the sternum quite to its sides.

Like *Sesarma*, this genus has the third joint of the outer maxillipeds rounded above. But *Sesarma* has a vertical front much longer than half the breadth of the carapax, besides straight sides, and an



abdomen which covers at its base the whole breadth of the sternum. The species here referred have a very thick body. The eyes are short. The anterior legs short and rather stout. The orbit is continued at its outer extremity in a broad furrow. The crest or ridge on the third joint of the outer maxillipeds is naked instead of pilose or ciliate; but we cannot say that this is a generic characteristic.

This genus in Edwards's system would fall into *Sesarma*.

#### SARMATIUM CRASSUM.

*Carapax obesus, supra laevis, lateribus valde arcuatis, fronte fere recto, margine antero-laterali leviter 2-emarginato, dentibus rotundatis. Pedes antici maris breves, manu supra transversim 4-5-plicatâ, extus fere laevi, digito mobili supra breviter 4-subspinoso, carpo plerumque laevi, supra paulo seriatim granulato.*

*Carapax obese*, smooth above, sides much arcuate, front nearly straight, antero-lateral margin faintly two-emarginate, the teeth rounded and slightly projecting. Anterior feet of male short, hand above transversely four to five-plicate, externally nearly smooth, moveable finger with four short rudiments of spines, carpus mostly smooth, a few seriate granules above.

Plate 23, fig. 1 *a*, male, natural size; *b*, under view, enlarged four diameters; *c*, male abdomen and sternum, enlarged two diameters; *d*, hand, enlarged three diameters.

Upolu, Samoan Group, Pacific Ocean.

Length of carapax, six and one-eighth lines; breadth, seven lines; thickness of the body, four and one-fourth lines; length of the front, three lines; length of the hand, four lines; length of third joint of posterior legs, three lines; of same joint of penult pair, four lines. This joint is much compressed, and has an acute tooth near apex, as in *Sesarma*; it is naked and slightly granulous on part of outer surface. Legs not pilose. Epistome granulous. Third joint of outer maxillipeds rather shorter than second. Sides of the carapax around to the mouth reticulated, as in *Sesarma*; a triangular space beneath the

orbit, transversely oblong, not thus reticulate. The surface of the carapax is but slightly areolate.

*S. crassum*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 251.

GENUS CYCLOGRAPSPUS, *Edwards*.

The genus *Cyclograpsus* is described by Edwards as having a ciliated crest or ridge upon the third joint of the outer maxillipeds, although with the mention that some exceptions to this exist. Moreover, the typical species, as accepted by him, are thus characterized. In dividing the genus, therefore, and separating species in which this ridge exists from the others in which it is wanting, the name *Cyclograpsus* if rightly employed, will be used for the former. On this ground, we reject the name *Gnathochasmus* of M'Leay, subsequently published, which corresponds to the typical *Cyclograpsi*, and give a new name, *Hemigrapsus*, to the other species, as described on a preceding page. Krauss refers the South African species (*Gnathochasmus barbatus* of M'Leay) to the genus *Sesarma*.\*

The carapax in the *Cyclograpsi* has an entire margin, a nearly or quite smooth surface, and also a curvately declivous front, the slope of which is carried around a short distance beyond the orbits, and diminishes laterally. The third joint of the outer maxillipeds has a truncate or excavate summit, and is not always shorter than the second joint, as described by Edwards. The third joint of the eight posterior legs has no tooth or spine near its apex, or only a rudimentary tooth.

The species are found along the sea-shore, under stones washed by the tides.

CYCLOGRAPSPUS AUDOUINII (*Edwards*).

Plate 23, fig. 2, under view of buccal area, and part of sternum adjoining.

From the Feejee Islands, or New Zealand, probably the latter.

\* Südaf. Crust., 45.



Length of carapax of a male, eight lines; breadth, ten lines; ratio, 1 : 1.25; breadth of front, four lines. Male abdomen narrowing much from third segment to penult, and outline in this part very slightly excavate; penult segment with arcuate sides; last segment about half as wide as penult, very slightly longer than wide, and broadly rounded at apex. Fifth joint of second pair of legs above, covered, upon apical half at least, with a very short tomentose coat; tarsus of same pair above tomentose, with either two very narrow naked lines, or none apparent. Fingers denticulate on inner edges. Ciliate crest of third joint of outer maxillipeds is produced backward, so as to reach the outer margin of the second joint, about two-thirds or three-fourths of the way to the base of this joint; third joint nearly naked, longer than broad and hardly shorter than the second. Fifteen or sixteen minute crenatures along the ridge below the orbit.

The abdomen differs widely from that of the Valparaiso species, in narrowing so much backward, and the orbits are also different in being very imperfect below. The eyes, moreover, are longer.

*Cyclograpsus Audouinii*, EDWARDS, Crust., ii. 78.

#### CYCLOGRAPSPUS CINEREUS.

*Carapax parce transversus, non areolatus, paulo nitidus, non granulatus. Orbita infra plerumque circumscripta. Articulus maxillipedis externi 3tius valde oblongus, 2do non brevior, pubescens, cristâ fere ad angulum 2di externo-posteriorem productâ. Digiti intus denticulati. Articulus pedis 2di 5tus apice non tomentosus, tarso non spinuloso, lineis angustis tomentosis supra ornato. Abdomen maris fere rectangulatum, posticè parce angustius, lateribus subparallelis, rectis, segmento postico elongatè triangulato, triplo angustiore quam penultimum. Sternum pone aream buccalem pubescens.*

Carapax sparingly transverse, not areolate, a little shining, not granulous. Orbit mostly complete below. Third joint of outer maxillipeds much elongate, not shorter than second, pubescent, crest extending back towards posterior outer angle of second joint. Fingers denticulate on inner edges. Fifth joint of second feet not tomentose at apex; tarsus not at all spinulous, having a few narrow

tomentose lines. Abdomen of male nearly rectangular, slightly narrower posteriorly, the sides subparallel and straight, last segment oblong triangular, one-third as broad as penult. Sternum behind the mouth pubescent.

Plate 23, fig. 3 *a*, male, natural size; *b*, under view, enlarged four diameters; *c*, abdomen of male, enlarged two diameters; *d*, hand, *ibid.*; tarsus of fourth pair, enlarged.

Valparaiso, Chili; also Sandwich Islands.

Length of carapax of a male, 6 lines; breadth, 7.15 lines; ratio, 1:1.19; length of front, three lines. The outer maxillipeds are pubescent, excepting the part anterior to the crest; and posterior to the mouth the sternum for a short distance is short hairy. The pterygostome is pubescent. The orbit is like that of the *integer*, but the tarsi are not at all spinulose; a character, according to Edwards, of that species. The general form is like that of the *Audouinii*, but less broad for the length. The apex of the fifth joint of the posterior legs is often tomentose, although that of the second pair is not so. The tarsus and preceding joint have a few distant hairs below. The character of the orbit separates it from either the *punctatus* or *Audouinii*. It has the third joint of the outer maxillipeds much more oblong than in the *barbatus*, as this South African species is figured by Krauss, Südaf. Crust., pl. 3, f. 3.

The Sandwich Island specimens have similar maxillipeds, legs, abdomen, and other characters.

*C. cinereus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 251.

#### CYCLOGRAPSPUS GRANULATUS.

*Carapax non areolatus, antice paulo granulatus. Orbita infra incompleta. Articulus maxillipedis externi 3tius vix oblongus, 2do multo brevior, nudus, cristâ tenui, pilosâ, angulum 2di externo-anteriorem intersecante tantum; 2dus nudus. Articulus pedis 2di 5tus apice non tomentosus, tarso lineis tomentosis paulo laxis ornato, non spinuloso. Manus glabra, nitida, digitis maris intus non denticulatis. Abdomen*



maris ferme ac in cinereo, lateribus vix excavatis, segmento postico parce oblongo, apice late rotundato. Sternum pone aream buccalem nudum.

Carapax not areolate, anteriorly somewhat granulous. Orbit incomplete below. Third joint of outer maxillipeds very slightly oblong, much shorter than second, naked excepting crest, which is quite slender, and crosses only the antero-external angle of the second joint; second joint naked. Fifth joint of second feet not tomentose at apex, tarsus with lines which are rather lax tomentose, not at all spinulous. Hand smooth and shining, fingers of male not denticulate within. Male abdomen nearly as in the *cinereus*, sides very slightly excavate, last segment very little oblong, apex broadly rounded. Sternum immediately behind the mouth naked.

Plate 23, fig. 4 *a*, male, enlarged two diameters; *b*, outer maxillipeds, enlarged five and a half diameters; *c*, male abdomen, enlarged four diameters; *d*, hand, enlarged four diameters; *e*, tarsus of fourth pair, enlarged.

Island of Maui, Hawaiian Group, Pacific.

Length of carapax of male, 3.7 lines; breadth, 4.6 lines; ratio, 1:1.24. Sides rather regularly arcuate. Fingers somewhat gaping, and remarkable for being entire within instead of denticulate. There are some faint traces of areolation.

*C. granulatus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 251.

#### GENUS CHASMAGNATHUS, *De Haan*.

The genus *Chasmagnathus* is between *Helice* and *Hemigrapsus* in its characters. It has the narrow and curvately declivous front, thick body, and outer maxillipeds of *Helice*, but with arcuate sides emarginated anteriorly, and short eyes, as in *Hemigrapsus*. Like *Helice*, moreover, the fourth joint of the outer maxillipeds is articulated with the third joint, nearer its outer apex than in most of the *Grapsidæ*, though nearly as in *Goniograpsus cruentatus*. The third joint of the outer maxillipeds may be even longer than the second, and is dilated

a little on the outer side; it is truncate or excavate at top. The lower margin of the epistome sometimes projects more forward than the front, so as to be seen in a vertical view. The base of the outer antennæ is separated from the orbit by a triangular process, usually broader than high. Orbits open at the outer side. Tarsi unarmed. A small tooth at the apex of the third joint of the eight posterior legs. Basal part of abdomen not as broad as the corresponding part of sternum.

## CHASMAGNATHUS SUBQUADRATUS.

*Carapax convexus, lævis, postice paulo punctatus, paulo areolatus, fronte margineque antero-laterali uti in C. granulato, lateribus parce arcuatis, areolâ præmedianâ anticè vix circumscripta. Maxillipedes externi sternique pars proxima brevissimè hirsuti. Pedes antici posticique plerumque uti in C. lævi, manu non granulata, minutè punctatâ. Regio pterygostomiana breviter reticulata. Articulus pedis 2di 5tus infra non tomentosus, supra anticeque tomentosus. Abdomen lateribus excavatum, basi latius, longius ciliatum.*

Carapax convex, smooth, somewhat punctate posteriorly, a little areolate, front and antero-lateral margin as in the *lævis*, sides but slightly arcuate, præmedial areolet hardly distinct before or elsewhere. Posterior part of outer maxillipeds, and adjoining part of sternum very short hirsute. Feet nearly as in the *lævis*, hand not granulate, minute punctate. Pterygostomian region very short reticulate. Fifth joint of second feet tomentose above and on anterior surface, but not below. Abdomen broader than usual at base and longer ciliate, sides excavate.

Plate 23, fig. 5 *a*, outer maxillipeds, enlarged two diameters; *b*, hand, natural size; *c*, abdomen, natural size.

New South Wales? New Zealand?

Length of carapax of male, eight lines; breadth, nine and one-fourth lines; length of front between the eyes, four lines. The surface depressions are nearly as in the *lævis*. The third joint of the



outer maxillipeds is rather longer than the second, and very densely long hairy at its inner margin, and the second joint is densely villous on part or all of its surface. The surface of the sternum between the buccal area and the apex of the abdomen, and for a short distance beyond, is densely short hirsute, but naked beyond this part. The width of the penult segment is not more than two-thirds that of the third. The reticulation of the pterygostomial surface is neat, and extends over the sides of the carapax with the same regular character and distinctness.

*Cyclograpsus Gaimardii?* EDWARDS, Crust., ii. 79.

*Chasmagnathus subquadratus*, DANA, Proc. Acad. Nat. Sci. Philad., v. 251.

#### CHASMAGNATHUS GRANULATUS.

*Carapax valde convexus, sat areolatus, fronte sinuato, medio depresso et juxta marginem minutè apiculato, margine antero-laterali tenui, 2-inciso, dentibus triangulatis, acutis. Margo epistomatis inferior fronte prominentior. Pedes antici maris crassi, subæqui, granulati, carpo intus acuto, manu supra tenui et paulo obtusâ. Pedes postici valde compressi, articulis 4to 5toque dorso paulo tomentosus, 5to pedis 2di infra non tomentosus, tarso tenui, tenuiter sulcato et sulcis hirsuto. Abdomen maris lateribus fere rectum.*

Carapax very convex and considerably areolate; front arcuate, slightly excavate at middle, and having a minute point on the surface; antero-lateral with two incisions. Posterior margin of epistome more projecting than the front. Anterior feet of male stout, subequal, granulate, carpus acute within, upper margin of hand a little obtuse. Posterior feet much compressed, fourth and fifth joints somewhat tomentose along the back, tarsus slender and fine sulcate, with a range of short hairs on the sulci. Sides of abdomen nearly straight and regularly convergent.

Plate 23, fig. 6 *a*, male, natural size; *b*, under view, enlarged two diameters; *c*, male abdomen and sternum, natural size; *d*, hand, natural size.

Marshes of Lake Peteninga, near Rio Janeiro, Brazil.

Length of carapax of male, fifteen lines; breadth, seventeen and a half lines; length of front measured between eyes, seven lines; length of hand of male to apex of moveable finger extended, twenty lines; height of hand, nine and a half lines; height of hand of female of like size, five lines. The intramedial areolet is strongly circumscribed, excepting its anterior prolongation; the surface is quite convex either side of the medial line in front, but the outline of the præmedial areolet is not distinguishable. The third joint of the outer maxillipeds is rather longer than the second. On the postero-lateral region there is a raised line running obliquely inward and backward. Besides the two incisions or emarginations on the lateral margin, as described, there is another obsolete one more posteriorly.

*C. granulatus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 251.

#### CHASMAGNATHUS LÆVIS.

*Carapax convexus, lævis, vix granulatus, paulo areolatus, fronte marginæque antero-laterali uti in granulato sed fronte juxta marginem medio non apiculato, areolâ præmedianâ antice præruptâ. Epistoma fronte nunquam prominentius. Pedes antici maris æqui, manu leviter granulata, supra non tenui. Pedes postici angustiores; articulus pedis 2di 5tus infra antice supraque tomentosus. Abdomen lateribus fere rectum, obsolete excavatum.*

Carapax convex, smooth, hardly granulous, somewhat areolate, front and antero-lateral margin as in the *granulatus*, but the front not having a point near the margin at middle; præmedial areolet abrupt anteriorly. Epistome in no part more prominent than the front. Anterior feet of male equal, hand slightly granulate, not thin above. Posterior feet narrower than in *granulatus*, fifth joint of second pair tomentose above and below and on the anterior side. Sides of abdomen nearly straight, obsoletely excavate.

Plate 23, fig. 7 *a*, male, natural size; *b*, male abdomen and sternum, *ibid.*; *c*, outer maxillipeds, enlarged two diameters; *d*, natural size.

Sydney, New South Wales.



Length of carapax of a male, eleven and a half lines; breadth, fourteen lines; length of front between the eyes, six lines; height of head, six and a half lines. The carapax has a transverse depression but no distinct areolets, excepting the cardiac, which is nearly hexagonal. The third joint of the outer maxillipeds is about as long as the second, the second has its surface partly naked. There is an oblique raised line on the postero-lateral region, but it is hardly distinct. There are no indications of a *third* emargination on the lateral margin, like that of the *granulatus*. The surface of the sternum between the buccal area and the apex of the abdomen is naked, excepting very near this area.

*C. laevis*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 252.

GENUS HELICE, *De Haan*.

*Carapax subquadratus, angulis anticis acutis, fronte paulo brevior quam latitudinis dimidium carapacis, septoque inter-antennali medio connatis. Oculi tertio latitudinis carapacis breviores. Articuli maxillipedis externi 2dus 3tiusque obliquè canaliculati, 3tio paulo oblongo non brevior quam 2dus, apice latiore. Pedes maris antici sat breves.*

Carapax nearly quadrate, anterior angles acute, front somewhat shorter than half the breadth of the carapax, and coalescing with the inter-antennary septum below. Eyes shorter than one-third the breadth of the carapax. Second and third joints of outer maxillipeds with an oblique longitudinal channel, the third joint a little oblong, not shorter than second, at apex broadest. Anterior feet of male rather short.

This genus differs from *Sesarma* and other *Grapsidæ* in its narrow male abdomen. It has a broader front and shorter eyes than *Cleistostoma*, and this front unites below with the septum, between the inner antennæ.

The fossettes of the inner antennæ extend laterally as far as the front, so that the outer antennæ stand just outside the outer angle of the front. The basal joint of these antennæ is very broad and

short. The legs are naked, or nearly so, and the tarsus quite unarmed. The body is rather thick, on either side as well as at middle, but has the lateral margin acute, and forming a kind of border.

The male abdomen has seven distinct segments.

#### HELICE CRASSA.

*Carapax subquadratus, margine laterali anticè bi-emarginato, fronte dimidii latitudinis carapacis longitudine. Manus brevis et lata, supernè subcarinata; extus fere lævis, minutè granulata. Articulus pedum sequentium 3tius supra subacutus. Regio pterygostomiana granulata, leviter pubescens.*

Carapax subquadrate, lateral margin with two emarginations anteriorly, front half as long as breadth of carapax. Hand short and broad (or high), above subcarinate, externally nearly smooth, minutely granulate. Third joint of following feet subacute above. Pterygostomian region granulate, thin pubescent.

Plate 23, fig. 8 *a*, animal, enlarged two diameters; *b*, outer maxillipeds, enlarged four diameters; *c*, hand, enlarged two diameters; *d*, abdomen of male, *ibid*.

Shores of Illawarra, New South Wales.

Length of carapax, five and a half lines; breadth, six and one-fourth lines; ratio of length to breadth, 1 : 1.13. The upper margin of the orbit is somewhat oblique backward and outward instead of transverse. The surface of the carapax is naked, but hardly shining, and somewhat uneven. Posterior to the hinder tooth there is a slightly raised oblique line on the surface of the carapax. The front meets the antennary septum at its middle, and the fossettes either side are triangular in outline. The pterygostome has a smooth channel parallel with the sides of the buccal area, a short distance from it, and also another passing backward parallel nearly with the lower margin of the orbit. The lower orbital margin is minutely crenulate. The surface above the legs as well as the pterygostome is throughout granu-



lous. The last abdominal segment in the male is hardly longer than its breadth at base, has a broadly rounded apex, and is about half as broad as the penult segment.

*H. crassa*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 252.

### SUBFAMILY III. PLAGUSINÆ.

#### GENUS PLAGUSIA.

De Haan, besides separating the genus *Acanthopus* from the old *Plagusia*, makes two genera of the remainder; one, *Plagusia* (corresponding to *P. squamosa* of authors), having a flagellum terminating the palpus of the outer maxillipeds, and the other, *Philyra* (corresponding to *Plagusia depressa*), having no flagellum to this palpus. The name *Philyra* was earlier used by Leach for a genus of *Oxystomes*; moreover, we are not satisfied that the character mentioned, is in this case of sufficient importance to require the separation into two genera.

1. *Articulus pedum 8 posticorum 3tius non multispinosus.*

#### PLAGUSIA SQUAMOSA (*Herbst*), *Lamarck*.

Island of Madeira.

Length of carapax of a male, eighteen and three-fourths lines; greatest breadth, nineteen lines; length of a female, eighteen and one-fourth lines; breadth, nineteen lines.

In the areolation of this species the normal areolets may be distinguished. In the medial region the intramedial and extramedial areolets are distinct; the præmedial, which is not separated from the extramedial, terminates in a point or short spine on the front either side of the medial line. The posterior part of the intramedial areolet is arcuate or angulate either side. Of the four lateral teeth, the posterior is S, and the first probably includes D and E, as numerous species in other groups exemplify; the second and third will then be N and T. Of the antero-lateral areolets, 6 L is distinct, but the others,

excepting 1 L, are coalescent or obsolete; 1 L is marked by a single small tubercle. The cardiac areolet is rather distinct and large. These areolets are much subdivided. The intramedial is made up of a posterior range hardly divided; another just anterior made up of four transverse tubercles; then a shorter transverse line sometimes concealed; then two transverse tubercles; then a transverse line, and then two more tubercles. In this species, the raised line adjoining the posterior margin of the carapax is broken up into a number of unequal tubercles.

*Cancer squamosus*, HERBST, i. 260, pl. 20, f. 113.

*Grapsus squamosus*, LATR., Hist. Nat. Crust., vi. 73.

*Plagusia squamosa*, LAMK., Hist. An. sans Vert., v. 247; LATR.; EDWARDS, Crust., ii. 44; DE HAAN, Faun. Japon., 31.

#### PLAGUSIA DEPRESSA (*Herbst*), *Latr.*

At sea, east of Straits of Sunda.

Specimen a small one. Length of carapax, seven lines; breadth, seven and a half lines.

In the absence of the flagellum from the palpus of the outer maxillipeds, this species is intermediate between *Acanthopus* of De Haan (*Plagusia clavimana* and the allied), and the *Pl. squamosa*, but this intermediate relation does not extend to the main branch of the outer maxillipeds or other distinctive characters, in which respects, it is very near the *squamosa* and the other thick-bodied *Plagusia*.

*Cancer depressus*, HERBST, pl. 3, f. 55.

*Grapsus depressus*, LATR., Crust., vi. 66.

*Plagusia depressa*, LATR. Encyc., x. 147; EDWARDS, ii. 93.

#### PLAGUSIA SPECIOSA.

*Squamosæ affinis. Margo antero-lateralis 3-dentatus.*

Near the *squamosa*; but antero-lateral margin with only three teeth.



Plate 23, fig. 9, carapax, natural size.

Waterland Island, Paumotu Archipelago.

Length of carapax, fourteen lines; breadth, fifteen lines. The carapax is tuberculate, like the *squamosa*, and the tubercles are depressed and edged with short scabrous hairs, as in that species; but the number of teeth is less. As we have only a carapax, we cannot give the characters from the legs and other parts. The range of tubercles adjoining the posterior margin of the carapax, consists simply of three linear parts, instead of being broken into smaller tubercles, as in the *squamosa*. Moreover, the intramedial region is different: it consists (beginning behind) of, first, a transverse crenate range, not divided (as in the *squamosa*); then, instead of a continuous range of four largish transverse tubercles, the four exist, but the two inner of these four are placed a little more anteriorly, and exteriorly overlap a little the outer, while behind the two inner there is a range of four minute tubercles, forming a very narrow line between the inner termination of the two outer. Anterior to these four, there is a transverse ridgelet (as long as the two inner tubercles just alluded to), hardly divided at middle, and corresponding to the two transverse tubercles in the *squamosa*; it has two small crenatures or flattened tubercles upon its posterior part, which correspond to a transverse line, more distinct and isolated, and having the same position as in the *squamosa*. These characters of the surface might be supposed to be subject to wide variations in the same species. We should not thus detail them from a single carapax alone, if we had not found a striking uniformity in different specimens of the *squamosa*, both large and small, male and female.

*P. speciosa*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 252.

2. *Articulus pedum 8 posticorum 3tius non multispinosus.*

PLAGUSIA TOMENTOSA, *Edwards.*

New Zealand; Illawarra, New South Wales; Cape of Good Hope.

Length of carapax of a female, twenty-one lines; breadth, twenty-two and two-thirds lines; breadth of front between antennary sinuses,

four and a half lines, and its length, two and one-fourth lines; border at middle spinulous, the spinules passing into granules either side. Hands very strongly costate, the costæ in all nine in number and neatly crenulate. Length of the hands in a male, fourteen lines, and height, five and a half lines; length in a female, ten lines, and height, four lines; giving very nearly the same ratio: length of upper margin to finger in male, five and a half lines, or more than a third greater than the height. Behind the process of the front that forms the inside of the orbit, on the back of the carapax, there is a small naked obtuse prominence. The specimens here measured and described were from New Zealand. Krauss's figure of a South African specimen (Südaf. Crust., pl. 2, f. 6) does not represent these naked points just alluded to, and the front has throughout a granulous margin, as described by Edwards, and not spinules at middle. De Haan's *Pl. dentipes* (Faun. Japon., 58, pl. 8, f. 1) differs widely in having the upper margin of the hand to the fingers, much longer than the fingers, and many scattered granules on the hand, while they are all in lines forming costæ in the *tomentosa*; the teeth too of the third joint of the eight posterior legs are coarser and fewer in the *dentipes*.

*Plagusia tomentosa*, EDWARDS, Crust., ii. 92; KRAUSS, Südaf. Crust., p. 42, Pl. 2, f. 6.

*Plagusia capensis*, DE HAAN, Crust., Faun. Japon., 58.

#### PLAGUSIA GLABRA.

*Carapax lævis, glaber, margine antero-laterali 4-dentato, fronte supernè obliquè subcristato, non spinigero. Pedes maris antici perbreves, parte manus basali breviorè quam alto, supra granulata, extus lævi et non costata, carpo fere lævi. Articulus pedum 8 posticorum 3tius lævis. Articulus maxillipedis externi 3tius quadratus, parce oblongus.*

Carapax smooth and glabrous, antero-lateral margin four-dentate, front above obliquely subcristate, not spinigerous. Anterior feet of *male* very short, part of hand preceding fingers shorter than its height, granulate above, smooth externally and not costate, carpus nearly smooth. Third joint of eight posterior feet smooth. Third joint of outer maxillipeds quadrate, slightly oblong.



Plate 23, fig. 10 *a*, animal, natural size; *b*, front view of front, enlarged four and a half diameters; *c*, outer maxilliped, enlarged four diameters; *d*, abdomen and sternum, natural size.

New South Wales.—Received from the Rev. Mr. Wilton, of Newcastle, N. S. W.

Length of carapax of a male, nine lines; breadth, nine lines, but between tips of lateral teeth, nine and two-thirds lines; length of hand, five lines; height, three lines; length of hand along upper margin to finger, one and three-fourths lines. The crest on the beak runs nearly parallel with the front margin either side of the medial depression; it is minutely crenulate as seen with a lens. The antennary incision is more oblique than in the other *Plagusiæ*, and not as deep. The carpus has a flattened surface and an acute point within, with the upper edge of this flattened surface nearly a right angle. The outer antennæ are placed quite obliquely, and the first joint has the outer apex much prolonged, the prolongation being equal in length to the second joint. The fingers are nearly entire on the inner edge. The form of the third joint of the outer maxillipeds is a little oblong, although scarcely narrower than the apex of the second joint, while in the other *Plagusiæ* it is transverse. The palpus of these maxillipeds has a flagellum, and the basal part is as long as the second joint of these organs.

GENUS ACANTHOPUS, *De Haan*.

The narrow oblong form of the third joint of the outer maxillipeds (much narrower than apex of second joint), together with the absence of a transverse plate from the inner branch of the first maxillipeds, and the very short palpus appended to the outer maxillipeds, it being a simple styliform joint, afforded De Haan sufficient ground for separating from the other *Plagusiæ* the species included in this genus.

ACANTHOPUS PLANISSIMUS (*Herbst*).

Madeira; Raraka, in the Paumotu Archipelago; Tahiti, Society



Islands; Tutuila and Upolu, Samoan or Navigator Islands; Island of Maui, Hawaiian Group.

Length of carapax of male, ten and a half lines; breadth, nine and three-fourths lines. The colour varies; sometimes a light grayish purple and grayish brown, with claws purplish (Raraka); or, the same with a longitudinal streak of light green down the middle of the back; commonly brown or brownish yellow, with a bright yellowish green streak along middle of back, as found at Raraka and elsewhere; at Madeira, reddish brown. In the male, the arm projects two and one-fourth lines beyond the extraorbital spine, which is just half its length, as measured below; in a female of like size, it projects about three-fourths of a line. In a small pale-coloured male from the Paumotus, four and a half lines long, it projects only half a line, or about one-third of its length. The tomentose coat covers the whole back, excepting a few linear spaces. The hand has an obtusish edge above.

In a female specimen from the Sandwich Islands, the two apical spines of the front or beak are coalescent nearly to their tips, instead of being divergent, so that they form a single spine with a bifid tip. In another (male), from the same region, the apical spines have the usual character, though shorter.

*Cancer planissimus*, HERBST, iii. 3, pl. 59, f. 3.

*Plagusia clavimana*, LATR., Gen., i. 34; DESMAREST, 127, pl. 14, f. 2; EDWARDS, Crust., ii. 92.

*Acanthopus clavimanus*, DE HAAN, Faun. Japon., 30; KRAUSS, Südaf. Crust., 42.

#### ACANTHOPUS ABBREVIATUS.

*Carapax subquadratus, non oblongus, supra omnino tomentosus, lineis nudis nullis, fronte ac in planissimo sed latiore; margine antero-laterali 4-dentato dente 2do inconspicuo. Pedes maris anteriori æqui, manu vix inflatâ, supra sulcatâ. Abdomen maris angustius, lateribus excavatum.*

Carapax subquadrate, not oblong, above tomentose throughout without any naked lines, front as in the *planissimus*, but wider; antero-lateral margin four-toothed, second tooth inconspicuous. Anterior



feet of male equal, hand hardly inflated, sulcate above. Abdomen of male rather narrow, with the sides excavate.

Plate 23, fig. 11 *a*, animal, enlarged one and a half diameters; *b*, outer maxilliped, *ibid.*; *c*, male abdomen and sternum, *ibid.*

Island of Tahiti, Society Group.

Length and breadth of carapax of male, six lines. Colour, reddish brown and grayish brown. The legs have much resemblance to those of the *planissimus*, though shorter, and the carapax is not so regular and distinct in its naked longitudinal lines, the tomentose coat being more general. The width of the front is equal to the distance from its base to the tip of its first spines (counting from base). The second apical spines are shorter than in the *planissimus*. The less inflated hand, sulcate above, and the absence of naked lines, as well as the shorter form, are good characteristics. The second tooth or spine of the antero-lateral margin rises just anterior to the third, and is mostly concealed by it, being also very small, the apex of the second not reaching as far forward as the apex of the third.

*A. abbreviatus*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 252.

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#### FAMILY IV. GECARCINIDÆ.

THE Gecarcinidæ pertain naturally to two groups or subfamilies, one having the termination of the outer maxillipeds *exposed* as usual, and the other having this part concealed beneath the second and third segments. The subfamilies and genera are as follows:—

SUBFAM. 1. UCAINÆ.—Articulus maxillipedis externi 4tus apertus.

1. *Maxillipedes externi non hiantes*.

G. 1. *UCA*, Leach.—Articulus maxillipedis externi 4tus angulo 3tii externo insitus.

G. 2. GECARCINICUS, *Edwards*.—Articulus maxillipedis externi 4tus marginis medio apicalis 3tii insitus.

2. *Maxillipedes externi latè hiantes.*

G. 3. CARDISOMA, *Latr.*—Articulus maxillipedis externi 4tus apice 3tii externo insitus.

G. 4. GECARCOIDEA, *Edwards*.—Articulus maxillipedis externi 4tus marginis medio excavato apicalis 3tii insitus.

SUBFAM. 2. GECARCININÆ.—Articuli maxillipedis externi 4tus et sequentes 3tio celati.

G. 1. GECARCINUS, *Latr.*

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SUBFAMILY I. UCAINÆ.

GENUS UCA, *Leach*.

UCA LÆVIS? *Edwards*.

Valparaiso? Rio Janeiro.

The specimen here referred to the *lævis* is a male. Length of carapax, twenty-eight lines; breadth, thirty-seven lines (greatest breadth much anterior to middle). Legs of the second pair longest, and its tarsus having a group of long hairs on the inner side towards apex. Hands very unequal, the largest as long as breadth of carapax, short spinous above and within, and fingers, carpus, and arm the same. The spines have a translucent horny texture.

GENUS CARDISOMA, *Latreille*.

CARDISOMA OBESUM.

*Carapax obesus, undique convexus, lateribus antero-lateralibus valde tumidis, lineâ elevatâ angulove marginis omnino carentibus. Articulus*



*antennarum externarum 1mus transversus, apice utrinque productus et subacutus, superficie granulatus, processu orbitam antennamque sejungente subtriangulato, trihedrico, non truncato.*

Carapax obese, throughout convex above, antero-lateral sides very tumid, without any trace of a margin or angle. First joint of outer antennæ transverse, apex either side of next joint prolonged and subacute; process adjoining (between the base of these antennæ and the orbit), subtriangular, trihedral, not truncate.

Plate 24, fig. 1, part of carapax, under side, natural size.

Peacock Island, of the Paumotu Archipelago.

Length of carapax, three inches; breadth, three and two-thirds inches; length of the front, between the eyes, twelve lines; same, between the angles of the margin just above the outer antennæ, nine and a half lines; breadth of buccal area anteriorly, nine lines. The process between the outer antennæ and orbits, has the outer side arcuate, the inner excavate, and the outer surface adjoining the inner margin concave. The second joint of the outer antennæ is small and polygonal. Upon the surface of the carapax near the front margin, the front of the præmedial areolet is but slightly indicated. The only specimen of this species saved from among the many collected, is a carapax.

*C. obesum*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 252.

#### CARDISOMA HIRTIPES.

*Carapax longitudinaliter convexus, margine laterali anticè notatus, prope dentem postorbitalem minutè apiculato, areolâ præmedianâ antice juxta frontem paulo abruptâ, regione pterygostomianâ pilosâ. Processus præorbitalis orbitam antennamque externam sejungens triangulatus, trihedricus. Articulus antennarum externarum 1mus rectangulatus, apice rectè truncatus. Pedes maris antici crassi, subæqui, sat breves, manu punctatâ, breviorè quam latitudo carapacis, parte manus ante digitos breviorè quam altiorè, digitis late hiantibus. Pedes postici hirti.*

Carapax longitudinally convex, lateral margin having a border anteriorly and a minute point near the postorbital angle, præmedian areolet near margin of front quite abrupt, pterygostomian region pilose. Process between orbit and outer antennæ triangular, trihedral. First joint of outer antennæ rectangular, truncate across above. Anterior feet of *male* short but stout, subequal, hand punctate, shorter than breadth of carapax, along upper margin to finger much shorter than high, fingers much gaping. Posterior feet rough hairy.

Plate 24, fig. 2 *a*, male, natural size; *b*, male abdomen and sternum; *c*, base of outer antennæ and the adjoining process between it and orbit; *d*, tarsus of fourth pair, enlarged.

Feejee Islands, Pacific.

Length of carapax of male, twenty-two and a half lines; breadth, twenty-eight lines; length of front, seven and a half lines; breadth of buccal area anteriorly, five and two-thirds lines; posteriorly, eight and one-fourth lines; length of upper margin of hand to finger, eight lines; height, thirteen and a half lines; whole length of hand, twenty-three lines. The angle on the lateral margin is continued through nearly half the length of the sides. The third joint of the eight posterior legs forms an edge above, which edge is hairy as well as the lower margin. Carpus entire and smooth, nearly rectangular and subacute on inner side. The line between the medial and posterior regions of the carapax, is situated much posterior to the middle of the carapax.

*C. hirtipes*, DANA, Proc. Acad. Nat. Sci. Philad., v. 253.

#### CARDISOMA CARNIFEX (*Herbst*), *Latr.*

Madeira?

We refer here a small male specimen, evidently young, which has the marginate sides of the *carnifex* and the tooth just behind the post-orbital tooth. It is four and three-fourths lines long, and five and a



half wide. The hands are nearly equal and short. The outer maxillipeds are naked, and the pterygostomial region hirsute.

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#### FAMILY V. PINNOTHERIDÆ.

THE Pinnotheridæ differ much in appearance, the form varying from wide transverse, through orbicular, to oblong triangular, the front becoming slightly rostrate in some species. In all, the sides are rounded, and the male abdomen behind is much narrower than the corresponding part of the sternum. They are often very much inflated and even subglobose, as in some Pinnotheræ, or depressed, with a flat thin body, as in the Hymenosoma. In Elamena, the third joint of the outer maxillipeds is nearly as in many Grapsidæ, smaller than the second. But in Hymenicus, it is somewhat larger than the second; in Hymenosoma, nearly twice as large; in Pinnotherelia, more than twice, and in Pinnothera and related species, the second is nearly obsolete. In the last-mentioned group, the outer maxillipeds have usually a very oblique position, the two of the pair diverging widely behind; yet this is not invariable, and *P. faba*, beyond, is an example of near parallelism.

The eyes in all are small, and in the species of *Halicarcinus* and *Hymenicus*, although imbedded in orbits, they cannot be retracted and concealed.

The species of this family naturally fall into two subfamilies. These subfamilies and the included genera are distinguished as follows:

1. PINNOTHERINÆ. — Articulæ maxillipedis externi 2dus parvulus aut obsoletus. Corpus sive obesum sive depressum.

1. *Oculi approximati. Fossæ antennales conjunctæ.*

a. *Pedes 8 postici sat graciles, subæqui.*

G. 1. PINNOTHERA, *Latr.* — Corpus obesum. Carapax superficie integerrimus, nunquam areolatus. Oculi normales.

G. 2. FABIA, *Dana.* — Corpus obesum. Carapax superficie anticâ pone orbitas suturâ longitudinali divisus. Oculi normales.

- G. 3. XENOPHTHALMUS, *White*.\*—Corpus obesum, fronte incisionibus duabus profundis oculos gerentibus instructo.
- G. 4. XANTHASIA, *White*.†—Corpus depressum, supra fere planum margineque elevato utrinque instructum, fronte paulo producto. Oculi normales.

b. Pedes 4ti longiores et multo validiores.

- G. 5. PINNIXA, *White*.‡—Corpus portentosé transversum.

2. Oculi sat remoti. Fossæ antennales septo latiusculo sejunctæ. Articulus maxillipedis externi 2dus fere dimidii 3tii longitudine.

- G. 6. PINNOTHERELIA, *Lucas*.§—Pedes 8 postici sat graciles, subæqui. Corpus suborbiculare.

2. HYMENICINÆ. — Corpus sæpius parce rostratum, depressum. Articulus maxillipedis externi 2dus dimidio 3tii major.

- G. 1. HYMENOSOMA, *Leach*.—Carapax suborbiculatus, angulo extra-orbitali acuto. Frons angustissimus, non lobatus, oculis valde approximatis.
- G. 2. HALICARCINUS, *White*.||—Carapax suborbiculatus, angulo extra-orbitali nullo. Frons tridentatus, antennis interuis inter dentes se porrigentibus, oculis remotioribus. Articulus maxillipedis externi 3tius 2do paulo major.
- G. 3. HYMENICUS, *Dana*.¶—Carapax suborbiculatus, angulo extra-orbitali nullo aut parvulo. Frons productus, simplex aut lobatus, antennarum basin celans, oculis remotioribus. Articulus maxillipedis externi 3tius 2do paulo major. Pedes gracillimi.
- G. 4. ELAMENA, *Edw*.—Carapax subtriangulatus, paulo oblongus, paulo rostratus, fronte antennas internas celante. Articulus maxillipedis externi 3tius 2do minor.

SUBFAMILY I. PINNOTHERINÆ.

The species constituting the subfamily Pinnotherinæ are usually

\* *White*, Ann. Mag. Nat. Hist., xviii. 177, and Voy. of Samarang, p. 63. The genus *Fabia* forms a transition from Pinnothera to Xenophthalmus; it includes the *P. chilensis*.

† Ann. Mag. Nat. Hist., xviii. 176.

‡ Ann. Mag. Nat. Hist., xviii. 177. Includes Say's *Pinn. cylindricum*, Jour. Acad. Nat. Sci. Philad., i. 452.

§ Crust. of D'Orbiguy's S. Amer., p. 24. The genus forms a transition to the Gecarcinidæ.

|| Ann. Mag. Nat. Hist., xviii. 178.

¶ The genus *Hymenosoma* belongs to the Cape of Good Hope; *Halicarcinus* to the extremity of South America, and *Hymenicus* to New Zealand.



thick and inflated forms; yet, as in *Xanthasia*, they may have the depressed back of a *Hymenosoma*. The fossæ of the inner antennæ are generally coalescent, and the front very narrow; but in the genus *Pinnotherelia*, the front is wide, and the union of it medially with the epistome below, forms a rather wide separation between the antennary fossettes.

GENUS PINNOTHERA.

PINNOTHERA OBESA.

*Carapax plus minusve transversus, interdum suborbicularis, obesus, nudus, nitidus. Maxillipedes externi nudi, articulo tertio transversim insito, marginibus oppositis extus convergentibus. Oculi parvuli. Pedes nudi; antici mediocres, manu tumidâ supra rotundatâ, infra non pubescente, digitis crassis, intus pubescentibus, superiore crassiore; pedes postici gracillimi, tarso tenui, infra breviter pubescente, articulo quinto versus apicem vix pubescente.*

Carapax transverse elliptical, obese, naked, shining. Outer maxillipeds naked, third joint placed transversely, the opposite margins converging outward. Eyes quite small, and in female, not seen from above. Feet naked, the anterior of moderate size, hand a little compressed, rounded above, not pubescent below, fingers stout, pubescent on the meeting surfaces; posterior legs very slender, tarsus slender, short pubescence below; a few hairs towards apex of fifth joint.

Plate 24, fig. 3 *a*, small male, enlarged three diameters; *b*, *c*, outlines of different females, natural size; *d*, under view of front of fig. *a*; *e*, outer maxillipeds of fig. *b*, enlarged; *f*, same, more enlarged; *g*, seta of same; *h*, male abdomen; *i*, hand, enlarged three diameters.

Feejee Islands.

Length of carapax of a female, four and three-fourths lines; breadth, six and one-third lines. Of a male slightly broader than long, the third joint of the fourth pair of legs is two and three-fourths lines

long, or nearly half the breadth of the carapax. In a small male and also a female of like size, the eyes are seen in an upper view, and the front margin, in this view, seems to be emarginated by the orbits; the breadth in each is but slightly transverse. In a larger female, the eyes in one specimen are seen in an upper view, but not so in a second specimen. The outer maxillipeds have, as usual, the last joint attached to the inner side of the penult, and not reaching beyond its apex; this joint is narrow linear.

This species is near the *P. globosus* of Hombron and Jacquinot (Voy. au Pole Sud, pl. 5, f. 21, 26); but the upper finger has not the prominent tooth, represented in their figure, and the outer maxillipeds are of very different form; the breadth at the lower extremity (outer as the organs lie in the animal) is very narrow, not half as wide as that towards the other extremity.

## PINNOTHERA FABIA.

*Carapax latè transversus, nudus, paulo nitidus. Maxillipedes externi nudi, vix obliqui. Oculi parvuli. Pedes antici feminæ breves, manu supra rotundatâ, digitis subtiliter pubescentibus. Pedes postici per-breves crassiusculi, articulo tertio pedis 4ti triplo breviorè quam carapacis latitudo, tarso brevi, basi crasso, subconico, apice uncinato.*

Carapax very broad transverse, naked, somewhat shining. Outer maxillipeds naked, nearly longitudinal. Eyes small. Anterior feet of female short, hand rounded above, fingers minutely pubescent. Posterior feet quite short and stout, third joint of fourth pair one-third as long as breadth of carapax, tarsus short, subconical from a stout base, uncinately at apex.

Plate 24, fig. 4 *a*, female, natural size; *b*, outer maxillipeds, enlarged; *c*, hand, enlarged.

Puget's Sound.

Length of carapax of a female, five and a half lines; breadth, eight lines; length of third joint of fourth pair of legs, two lines, and breadth of same, about one line; tarsus of same, about a line long.



A very little short pubescence on some of the joints of the legs; fingers very short pubescent, and hand very slightly so, more so on inner surface. Front faint pubescent.

*P. faba*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 253.

#### GENUS FABIA.

*Pinnotheræ affinis. Orbita margine superiore fissa; carapax pone orbitas suturâ longitudinali instructus aream medianam includens.*

Near *Pinnothera*. Carapax with a longitudinal suture behind the orbits enclosing between them the median area.

The slender subequal legs and general form are the same as in *Pinnothera*. The area included by the post-orbital suture on the back of the carapax, corresponds properly to the normal *median region*, together with the frontal, which is not separated. The suture—like the depression limiting the median region—begins in the margin of either orbit, and extends back to the middle of the carapax, in which part the two from either side meet. Unlike the depression in other Crustacea, the suture has sometimes a depth and distinctness, which seems almost like a division of the carapax. The upper margin of the orbit in the *Pinnotheræ* is entire; while in the *Fabia* it is cut through by the termination of this suture. In this suture we see a transition step towards the deep incisions of the front, from which the eyes proceed in *Xenophthalmus* of White.

#### FABIA SUBQUADRATA.

*Carapax (feminæ) subquadratus, antice rotundatus, parce latior quam longus, nudus, nitidus. Maxillipedes externi nudi, valde obliqui. Oculi minimi. Suturae postfrontales fere parallelæ. Pedes antici feminæ sat tenues, manu elongatâ, infra 2 lineis pubescentibus (lineâ unâ usque ad digiti extremitatem productâ) ornatâ. Pedes 8 postici sat graciles, articulo 3tio supra partim pubescente, 5to infra pubescente, tarso brevi, dimidii articuli 5ti longitudine, uncinato.*

Carapax (of female) subquadrate, rounded anteriorly, slightly broader than long, naked, shining. Outer maxillipeds naked, very oblique. Eyes very small. Post-frontal sutures nearly parallel, included area oblong. Anterior feet of female rather slender, hand long, two pubescent lines below, one reaching to extremity of finger; eight posterior feet rather slender, third joint partly pubescent above, fifth, same below, tarsus short, half as long as fifth joint, uncinatè.

Plate 24, fig. 5 *a*, female, back view, natural size; *b*, same, under view; *c*, under view of front, enlarged nearly six diameters; *d*, hand, enlarged five diameters; *e*, extremity of leg.

Puget's Sound.

Length of carapax, five and three-fourths lines; breadth, six and three-fourths lines; breadth between the post-frontal sutures, two and one-fourth lines; length of third joint of fourth pair of legs, two and three-fourths lines, or length about two-fifths of the breadth of the carapax. Female abdomen very broad transverse elliptical.

*F. subquadrata*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 253.

#### FABIA CHILENSIS.

From an Echinus, on the coast of Chili, near Valparaiso.

*Pinnothera chilensis*, EDWARDS, Crust., ii. 33; EDWARDS and LUCAS, Crust., D'Orbigny's S. A., 23, pl. 2, f. 2.

#### GENUS XANTHASIA, *White*.

The carapax in *Xanthasia* has an elevated margin, an elevated quadrate area on the upper surface near middle, and two oblong elevations just posterior to the front.

The species observed by the author has the habits of a *Pinnothera*, and the depressed carapax of a *Hymenosoma*, although the body is much thicker. The outer maxillipeds are like those of a *Pinnothera*. The male abdomen is very narrow.

*Xanthasia*, A. WHITE, Ann. and Mag. Nat. Hist., xviii. 176, Sept., 1846.



XANTHASIA MURIGERA, *White.*

*Carapax paulo transversus, muro marginali tenui lateraliter posticèque omnino circumscriptus, muro anticè paulo involuto, rostro rotundato integro. Oculi parvuli. Pedes breviusculi, nudi. Manus brachio vix crassior, nuda, oblonga, digito triplo brevior quam manus. Tarsi perbreves, valde uncinati.*

Carapax a little broader than long, bordered laterally and also behind by a thin, elevated ridge, which anteriorly curves around a little spirally. Beak rounded, entire. Eyes small. Feet rather short, naked. Hand hardly stouter than arm, naked, oblong, finger one-third as long as hand. Tarsi short and strong uncinatè.

Plate 24, fig. 6 *a*, animal, enlarged two and one-fourth diameters; *b*, under view, enlarged eight diameters.

From a *Mytilus*, obtained from the reefs of Vanua Lebu, of the Feejee Archipelago, near Mathuata, 1840.

Length of carapax of a female, four lines; breadth, five lines.

The ridge bordering the carapax in our specimen is very thin, with the edge acute. The front margin between the eyes and the elevated ridge has a low angle. The eyes are very small, as in *Pinnothera*. The legs are not hairy. The epistome is subtriangular, and the part upon which the outer antennæ rest is wholly separated from the inner portion. The surface is unevenly pitted.

*Xanthasia murigera*, A. WHITE, Ann. and Mag. Nat. Hist., xviii. 176, pl. 2, f. 3, 1846.

## SUBFAMILY II. HYMENICINÆ.

The genus *Hymenosoma* has a projecting tooth or angle, just exterior to the eyes, and the front is a narrow point equally projecting between the eyes. There are other related species, in which the margin of the carapax has no extra-orbital projection, and the eyes are more distant; moreover, the front between the eyes has three

tooth-like projections, between which (the middle and either outer tooth) the inner antennæ project. These teeth proceed from the front, just below the front edge of the carapax, this edge appearing to be truncated. The genus *Halicarcinus* of White, was based upon a species of this kind. Still, others have the front produced and either entire or lobed, and the inner antennæ are concealed at base; these also have the margin of the carapax outside of the orbit, nearly or wholly, without an extra-orbital tooth. Of these species we make the genus *Hymenicus*. In all, the carapax is flattened above. In the last two genera, the eyes are situated in orbits, but, like the *Periceridæ*, they are not retractile, so as to conceal the summit or any part of it.

The genus *Hymenosoma* occurs at the Cape of Good Hope, *Halicarcinus* at Tierra del Fuego and the Falkland Islands, and *Hymenicus* at New Zealand.

The species of this family live under stones along the sea-shore, where washed by the tide. The species of Tierra del Fuego were found abundantly in such positions, and so also those of New Zealand.

#### GENUS HALICARCINUS, *White*.

Mr. Adam White does not particularly describe the front in giving the characters of his genus, but mentions that it contains the species from the Falkland Islands and that figured by Guérin, which are quite distinct in the character of the front from the species of New Zealand examined by us. We therefore take the Falkland species as the type of his genus, the general outline of which, even to the front, is well represented by Guérin. The margin of the carapax in front, is not directly connected with the teeth, which arise from a somewhat lower level, and often have a softer texture, and a few short hairs at apex.

The back is either flat or concave, and on the lateral margin there are two distant obsolescent teeth. When these teeth are most prominent they appear to consist of three or four slender papillæ.

#### HALICARCINUS PLANATUS (*Fabr.*), *White*.

Plate 24, fig. 7 *a*, animal, enlarged; *b*, outer maxilliped.



Nassau Bay, Tierra del Fuego, abundant.

Length of carapax, four to five lines. Colour, mostly dark reddish brown, somewhat clouded. Carapax transversely orbiculato-elliptical. Upper surface of carapax smooth. Feet slender and very nearly naked. Tarsus of eight posterior legs but little shorter than preceding joint and nearly straight, short hirsute within. Second and third joints of outer maxillipeds nearly equal, surface pubescent. Buccal area nearly square.

*Leucosia planata*, FABR., Ent. Syst., Suppl., 350.

*Halicarcinus planatus*, WHITE, Ann. Mag. Nat. Hist., xviii. 178, 1846, pl. 2, f. 1.

*Hymenosoma Leachii*, GUERIN, Icon., pl. 10, f. 2, and Voy. de la Coquille, ii. 22.

*Hymenosoma tridentatum*? HOMBRON and JACQUINOT, Voy. au Pole Sud, pl. 5, f. 27. This figure is referred to the *planatus* by White; but the form as represented, is more transverse; and as no description has yet been published, we feel still uncertain as to its identity with the above.

#### HALICARCINUS PUBESCENS.

*Carapax ovato-orbicularis, pone medium latior. Pedes longitudine mediocres, 8 postici laxè pubescentes. Abdomen maris angustum, fere lineare, apice triangulatum.*

Carapax ovato-orbicular, broadest posterior to middle. Feet of medium length, eight posterior lax pubescent. Abdomen of male narrow, nearly linear, triangulate at apex.

Plate 24, fig. 8, male, enlarged.

From a depth of fifty fathoms, off Cape Blanco, the east coast of Patagonia, where it was dredged up by Lieut. Case. It was found in holes, or upon the surface of coral or stones.

Length, one-tenth of an inch. The back is slightly concave, and either side there are two small teeth (the anterior nearly obsolete), situated, as usual in the genus, on the lateral surface, below the margin. The sides of the male abdomen are for the most part parallel, the last joint a nearly equilateral triangle.

*H. pubescens*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 253.

## GENUS HYMENICUS, Dana.

*Carapax depressus, planus, suborbiculatus. Frons paulo productus breviter obtusè rostratus, aut paulo trilobatus, antennis internis quoad basin carapace omnino tectis. Pedes tenues, manu mediocri.*

Carapax depressed, flat, suborbicular. Front with a short rounded or trilobate beak, the first antennæ not being seen in an upper view, the base being wholly concealed beneath the carapax. Feet slender, hand of moderate size.

In this genus, the front has not the three teeth of *Halicarcinus* (between which the flexed first antennæ are seen), but a simple rounded or trilobate prominence forms the front, and the first antennæ are covered. The feet are much longer and more slender than in any of the species of *Halicarcinus*, seen by the author. As in *Halicarcinus*, the eyes are more distant than in *Hymenosoma*, and there is no prominent extra-orbital tooth, or but a slight one.

The genus includes the *Hymenosoma depressum* of Hombron and Jacquinot (Voy. au Pole Sud., pl. 5, f. 34), referred by White to his genus *Halicarcinus* (Ann. Mag. Nat. Hist., xviii. 178, 1846).

## HYMENICUS VARIUS.

*Carapax lævis, nudus, planus, ovato-orbiculatus, vix transversus, fronte expansus et trilobatus, margine antero-laterali dentibus duobus obsoletis armato. Abdomen maris angustum, subtriangulatum, segmento primo latiore et utrinque triangulato, penultimo angustiore quam precedens, ultimo paulo oblongo, apicem rotundato. Pedes antici mediocres, octo sequentes tenuissimi, fere aut omnino nudi.*

Carapax smooth, naked, flat, nearly orbiculate or ovato-orbiculate, very slightly wider than long, front projecting and trilobate, anterolateral margin with two obsolescent teeth. Abdomen of male narrow, oblong subtriangular, first segment broadest, and triangulate on either side, penult narrower than preceding, last oblong, subtriangular, rounded at apex. Anterior feet of moderate size, eight following very slender, nearly or quite naked.



Plate 24, fig. 9 *a, b*, different varieties, enlarged; *c*, exterior maxilliped; *d*, abdomen of male.

From the shores of the Bay of Islands, New Zealand.

Length, two to three lines. Colour various; often greenish black, or black and white in irregular areas, or wholly dirty white or grayish, mottled with brown.

The lobed front occupies the whole space between the eyes, and the middle lobe is most projecting. The two antero-lateral teeth are like those of *Hymenosoma*. The abdomen narrows from the second segment (which is very short), to the penult (narrowing more especially in the fourth segment), is then linear through the penult, but tapers again in the last segment, which is somewhat oblong. The legs are a little pubescent. The female abdomen is very broad and inflated, covering the whole space between the legs.

Figure 10, Plate 24, represents the abdomen of another specimen, probably of the above species. As all the other characters observed are those of the *varius*, we are not prepared to pronounce it distinct on the characters derived from the abdomen, as this part varies so much with growth.

*Hymenicus varius*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 253.

*Hymenicus Novi-Zelandiæ*, of the same place, is probably a variety of the *varius*.

#### HYMENICUS PUBESCENS.

*Carapax pubescens, fermè orbiculatus aut vix ovato-orbiculatus, posticè arcuatus, rostro parvulo simplicissimo, rotundato, et marginem pubescente, margine carapacis omnino integro, inermi. Abdomen maris angustum lineari-subtriangulatum, segmentis penultimo precedentibusque duobus fere æquis, postice parce angustantibus, ultimo subtriangulato, paulo oblongo, obtuso. Pedes breviter pubescentes; antici mediocres, sequentes tenues.*

*Carapax* pubescent, very nearly orbiculate or hardly ovato-orbiculate, arcuate behind, beak small, quite simple, rounded, margin pubes-

cent; whole margin of carapax entire, unarmed. Abdomen of male narrow, linear, subtriangular, penult joint and two preceding nearly equal, slightly narrowing posteriorly, last segment subtriangular, a little oblong, obtuse. Feet short pubescent, the anterior of moderate size, the others slender, but less so than in the *varius*.

Plate 24, fig. 11 *a*, animal, enlarged; *b*, abdomen of male; *c*, abdomen of female.

From the same localities as the preceding.

Length, one and a half to two lines.

The beak is subtriangular and small, and not lobed like the *varius*. The whole body above and below is pubescent, including legs and outer maxillipeds. The female abdomen is large and suborbicular, and has a low longitudinal elevation along the middle.

This species is very near the *Hymenosoma depressum* of Hombron and Jacquinot (Voy. au Pole Sud, pl. 5, f. 34;—*Halicarcinus depressus*, A. White, Ann. Mag. Nat. Hist., xviii. 178, 1846); but the figure of the *depressum* represents a small tooth on the margin, outside of the eyes, which does not exist in our species.

*H. pubescens*, DANA, Proc. Acad. Nat. Sci. Philad., 1851, v. 254.

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## FAMILY VI. MYCTIRIDÆ.

### MYCTIRIS LONGICARPIS, *Latr.*

From salt marshes near Sydney, New South Wales.

LATR. Encyc. Atlas, pl. 297, f. 3; GUERIN, Icon., pl. 4, f. 4; EDWARDS, Hist. ii. 57, and Cuv., pl. 18, f. 2.

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## V. CRUSTACEA LEUCOSOIDEA VEL OXYSTOMATA.

The group Leucosoidea includes those Brachyura in which the effe-



rent canal terminates at the middle, instead of the sides of the front of the buccal area. The area is, therefore, produced and narrowed forward, and the canal is generally a regularly formed channel, covered quite exactly by the inner branch of the first maxillipeds, which branch is narrow and much prolonged. These Crustacea are thus widely different from other Brachyura, and the triangulate form of the buccal area, by which they are distinguished, is the mark of a fundamental distinction. They are brought together by De Haan with the same limits and subdivisions as are here adopted, except that he includes the Raninidæ, an Anomoural form; the Corystidæ, a very different type, are excluded. The natural families are as follows:

1. *Appendices maris genitales basi pedum 5torum ortæ.* [*Via afferens pone regionem pterygostomianam ingrediens.*]

Fam. I. CALAPPIDÆ.—Articuli maxillipedis externi terminales non celati.

Fam. II. MATUTIDÆ.—Articuli maxillipedis externi terminales celati, 3tio triangulato, palpo vix longiore quam articulus 2dus.

2. *Appendices maris genitales sterno ortæ.*

Fam. III. LEUCOSIDÆ.—Via afferens apud angulum palati antero-lateralem ingrediens. Articuli maxillipedis externi terminales precedentibus tecti. Pedes postici ad normam gressorii.

Fam. IV. DORIPPIDÆ.—Via afferens parte regionis pterygostomianæ posticâ ingrediens. Articuli maxillipedis externi terminales precedentibus non celati. Pedes 2-4 postici subdorsales, prehensiles.

The known genera of living species pertaining to these families are distinguished as follows.

#### FAM. I. CALAPPIDÆ.

SUBFAM. 1. CALAPPINÆ.—Pedes nulli natatorii.

- G. 1. CALAPPA, *Fabr.*—Carapax valde transversus, lateribus alate expansis, pedes plerumque tegentibus.
- G. 2. PLATYMERIA, *Edw.*—Carapax transversim ellipticus, lateribus non expansis. Maxillipedis externi articulus 3tius 4tum margine interno gerens.
- G. 3. MURSIA, *Edw.*—Carapax fere orbiculatus, parce transversus, lateribus non expansis. Maxillipedis externi articulus 3tius 4tum margine apicali gerens, 2do non longior. Tarsi quinti styliformes.
- G. 4. CYCLOES, *De Haan.\**—Carapax suborbiculatus, sæpius non transversus, lateribus non expansis. Maxillipedis externi articulus 3tius 2do longior. Tarsi quinti angustè lanceolati.

SUBFAM. 2. ORITHYINÆ.—Pedes 8 postici natatorii.

- G. ORITHYIA.—Carapax suborbiculatus, non transversus, antice truncatus.

FAM. II. MATUTIDÆ.

- G. 1. HEPATUS, *Latr.*—Carapax valde transversus. Pedes nulli natatorii.
- G. 2. THEALIA, *Lucas.†*—Carapace *Matutæ* affinis. Pedes nulli natatorii.
- G. 3. MATUTA, *Fabr.*—Carapax suborbiculatus. Pedes 8 postici natatorii.

FAM. III. LEUCOSIDÆ.

A. CARAPAX LATERE SÆPIUS NON DILATATUS, LATERIBUS PEDES RETRACTOS  
NON TEGENTIBUS.

1. *Carapax lateribus non spinigerus nec cylindricè productus. Articulus maxillipedis externi 3tius subtriangulatus.*

1. Palpus maxillipedis externi latissimus, maxillipede multo latior. [Carapax inermis. Area buccalis subquadratus.]

- G. 1. PHILYRA.—Carapax suborbiculatus, inermis, non tuberculatus, fronte posteriore quam epistoma. Antennæ internæ transversæ.

2. Palpus maxillipedis externi maxillipede aut vix latior aut angustior.

- a. *Pedes antici breves vel mediocres, crassi.* [Carapax inermis. Area buccalis subtriangulata.]

- G. 2. LEUCOSIA, *Fabr.*—Carapax non tuberculatus, latere non dilatatus, antice angustè productus, extremitateque oculos minutos antennasque gerens. Palpus maxillipedis externi longus et latus, extus non dilatatus. Pedes antici mediocres.

\* De Haan, Faun. Japon., 67, 69, Decas Tertia, 1837, and p. 125, Decas Quinta. *Cryptosoma* of Brulé, Edwards's Crust., ii. 110, 1837, and Iles Canar. Ent., p. 16.

† Lucas, Ann. de la Soc. Ent. de France, viii. 573, tab. 21.



- G. 3. *LEUCISCA*, *M'Leay*.\*—Carapax non tuberculatus, latere non dilatatus, antice parce productus, antennis oculisque inferioribus, extremitateque frontis remotis. Palpus maxillipedis externi latus, brevis. Pedes antici breves [brachio parce exserto].
- G. 4. *EBALIA*, *Leach*.—Carapax interdum tuberculatus, latere dilatatus et margine tenuis, fronte latiusculo. Oculi grandiores, marginales. Palpus maxillipedis externi mediocris, extus rectus. Pedes antici mediocres. Antennæ internæ obliquæ, sat grandes.
- G. 5. *NUCIA*, *Dana*.—Carapax tuberculatus, latere non dilatatus, fronte latiusculo, oculis grandioribus, marginalibus. Palpus maxillipedis externi angustus, extus rectus, longus. Pedes antici breves. Antennæ internæ obliquæ, sat grandes.
- G. 6. *NURSIA*, *Leach*.—Carapax antice parce productus, denticulis tuberculisve partim ornatus. Palpus maxillipedis externi extus dilatatus.
- b. *Pedes antici prælongi, tenues.* [*Carapax duobus vel pluribus spinis tuberculisve postice armatus. Area buccalis triangulata.*]
- G. 7. *ILIA*, *Leach*.—Carapax globosus, postice 2–4 dentibus armatus, fronte bilobatus, latere non dilatatus. Palpus maxillipedis externi angustus, extus rectus. Digniti non in eodem plano cum manus articulatione. Pedes 8 postici subcylindrici.
- G. 8. *MYRA*, *Leach*.—Carapax ante medum paulo latior, postice 2–3-spinis armatus. Palpus maxillipedis externi angustus, extus paulo dilatatus. Digniti uti in *Leucosiâ*. Pedes 8 postici compressi.
- G. 9. *PERSEPHONA*, *Leach*.†—Carapax globosus, postice 3 spinis armatus, latere parce dilatatus. Palpus maxillipedis externi uti in *Iliâ*. Digniti pedesque 8 postici uti in *Leucosiâ*. Fossæ antennales fere transversæ.
2. *Carapax latere cylindricè productus.* [*Area buccalis subquadrata. Articulus maxillipedis externi 3tius subtriangulatus.*]
- G. 10. *IXA*, *Leach*.—Pedes antici gracillimi.
3. *Carapax latere spinigerus.* [*Area buccalis subquadrata. Articulus maxillipedis externi 3tius vix triangulatus, apicc latè rotundatus.*]
- G. 11. *IPHIS*, *Leach*.—Carapax paulo rhombicus, antice productus ac in *Leucosiâ*, supra inermis, spinâ longâ latere armatus, postice spinis paucis aliis. Pedes antici gracillimi.
- G. 12. *ARCANIA*, *Leach*.—Carapax globosus, undique multispinosus, fronte prominenter bilobatus. Pedes antici sat longi, medioeriter graciles.

\* M'Leay in Smith's Illustrations of Zool. of S. Africa, Crust., pl. 3.

† Includes Guaia, Edwards, Crust., ii. 127.

B. CARAPAX TRANSVERSUS, LATERE VALDE DILATATUS, LATERIBUS PEDES  
RETRACTOS TEGENTIBUS.

G. OREOPHORUS, *Rüppell*.\*—Carapax transversim subtriangulatus, latere subrotundatus, fronte angustus, paulo saliens.

G. TLOS, *White*.†—Carapax transversim subellipticus, regionibus lateralibus concavis, fronte integro, rotundato, sursum reflexo.

Mr. A. White also adds to the Leucosidæ, the genera *Harrovia* and *Iphiculus* (Voy. Samarang, pp. 55 and 57). The latter, as we have observed on a former page, is probably the same with Polydectus. The former has the general habit of the Parthenopidæ (especially *Ceratocarcinus*, *White*), not merely in form, but in the long hand with *short* fingers, and in the position of the hand upon the carpus. Still, if it is like the *Oxystomes* in the mouth and efferent channel, it belongs with the Leucosidæ. On this point we cannot decide, except from the reference of it by Mr. White to this group.

FAMILY I. CALAPPIDÆ.

CALAPPA TUBERCULATA (*Fabr.*)

Sooloo Sea; Feejees and Tongatabu, South Pacific; Sandwich Islands, North Pacific.

In the Voyage of the Bonite, this species from the Sandwich Islands is figured as new, under the name *C. Sandwichensis* (pl. 3, f. 9).—I find no essential difference between the specimens and that of the *tuberculata* from the Sooloo Sea.

FABR. Suppl. 345; HERBST, pl. 13, f. 78; GUERIN, Iconog., pl. 12, f. 2; EDWARDS, Crust. ii. 106.

CALAPPA GALLUS (*Herbst*), *Edwards*.

Philippine Islands; Maui, Sandwich Islands.

\* Rüppell, Krabben des rothen Mecres, 18, pl. 4, f. 5; Edwards, Crust., ii. 130; A. White, Voy. Samarang, 54, pl. 6, f. 1.

† A. White, Crust. Voy. Samarang, 57, pl. 13, f. 2.



*Cancer gallus*, HERBST, iii. 46, pl. 58, f. 1.

*Calappa gallus*, EDWARDS, Crust. ii. 105.

CALAPPA FORNICATA? *Fabr.*

Plate 25, fig. 1.

Only a carapax of this species was obtained. Its breadth was five and three-fourths inches; length, three and one-fourth inches; giving the ratio of length to breadth, 1 : 1.77. The surface is polished and quite smooth, with some transverse interrupted lines or scratches, and a few punctated lines or spots, as shown in the figure. There is no median or stomach region apparent. The beak is scarcely at all prominent, and is a little bifid. The orbits are large. The sides of the carapax are rounded and very projecting. The margin from the eye to where the curve commences to bend into the lateral lobe is crenate, with twelve or fourteen broad, but low and uneven crenations. The posterior margin of the carapax is regularly arcuate.

*Calappa fornicata*, FABRICIUS, Suppl., 345; EDWARDS, Crust., ii. 106.

*Cancer calappa*, HERBST, i. 197, iii. 3, 16, pl. 12, f. 73, 74. Much narrower proportionally than our specimen.

MURSIA CRISTATA, *Leach.*

Cape of Good Hope.

*Mursia cristata*, LEACH; EDWARDS, Crust., ii. 109, and Cuvier's Reg. An., pl. 13, f. 1.

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FAMILY II. MATUTIDÆ.

HEPATUS ANGUSTATUS (*Fabr.*)

Plate 25, fig. 2.

Rio Janeiro, Brazil, where it is common.

The hand has five raised lines on its outer surface, the upper of which is a range of small obtusish points; the next, similar points, but broader and sometimes coalescent; the others, nearly or quite continuous lines, with a crenate margin. Colour, pale yellowish brown, with dark brown transverse lines, or transverse series of spots; the legs are subochreous, with one or two large purplish blotches in each joint.

*Calappa angustata*, FABRICIUS, Supp., 347.

*Hepatus fasciatus*, LATREILLE, Hist. Crust., v. 988; EDWARDS, Crust., ii. 117, and Cuv., pl. 13, f. 2.

#### HEPATUS CHILENSIS, *Edwards*.

Plate 25, fig. 3.

Valparaiso, Chili.

Colour of carapax, a yellowish or ochreous base closely covered with a brownish purple reticulation.

*Hepatus chilensis*, EDWARDS, Crust., ii. 117; Crust. of D'Orbigny's S. America, 28, pl. 14, f. 1.—The colours in this figure resemble those of a faded specimen, after death or preservation in alcohol.

#### MATUTA LUNARIS (*Herbst*), *Leach*.

Cape of Good Hope; Tongatabu.

The carapax of the specimen from Tongatabu is reticulate with dark lines of dots. No such reticulation exists on the South African specimen.

*Cancer lunaris*, HERBST, iii. 43, pl. 48, f. 6.

*Matuta lunaris*, LEACH, Zool. Misc., iii. pl. 127, f. 345; EDWARDS, Crust., ii. 114.

#### MATUTA VICTOR, *Fabr.*

Singapore, East Indies.



The male has a crenated raised line along the outer side of the moveable finger, while in the female, the ridge is nearly or quite obsolete. The *lunaris* has the same ridge, but it is either smooth, or only crenated towards the extremity of the finger.

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FAMILY III. LEUCOSIDÆ.

IPHIS LONGIPES.

*Carapax parce granulosis, suborbicularis, non latior quam longus, armatus spinis duabus longissimis lateralibus latitudine carapacis vix brevioribus (unâ in latere utroque), et duabus minutis antero-lateralibus, duabus parvulis postero-lateralibus, et unâ posticâ corporis dimidium longitudine fere æquante. Frons bilobatus parce prominens. Pedes 8 postici prælongi.*

Carapax sparingly granulous, suborbicular, not broader than long, having two lateral spines (one either side) as long as breadth of body, two minute antero-lateral, two postero-lateral quite small, and one posterior nearly half as long as body. Front bilobate, sparingly prominent. Posterior feet very long and slender.

Plate 25, fig. 4 *a*, male, natural size; *b*, outer maxillipeds; *c*, abdomen.

Taken from the stomach of a Tetraodon, among the reefs of Viti Lebu, Feejee Islands.

Length, excluding the posterior spine, ten and a half lines; with this spine, fourteen and one-fourth lines; breadth, excluding the lateral spines, ten and three-fourths lines, and with these spines, twenty-four lines. The front of the carapax is less advanced than in Herbst's figure of the *septem-spinosa*. Besides, this species has either side but one postero-lateral spine, while there are two in the *septem-spinosa*, and both are much more prominent. The legs also are much longer. The hands and carpus together are as long as the breadth of the body and one lateral spine; the third joint of the second and third

pairs of legs extends out very nearly as far as the apex of the lateral spine.

The outer maxillipeds are like those of the genus *Arcania*, the third joint being rounded at apex. The body of the palpus extends as far forward as the apex of the third joint of the organs, and has nearly the same width.

#### GENUS NUCIA.

*Carapax parce transversus, antice non productus, latere non dilatatus, inermis, superficie paulo tuberculatus, fronte bilobatus et non saliens. Oculi paulo remoti, grandiores, marginales. Area buccali sbene triangulata. Maxillipedis externi articulus 3tius triangulatus; palpus angustus, extus rectus. Pedes toti breves et crassi, digiti in plano subverticali claudente, eodem cum manus articulatione.*

Carapax sparingly transverse, not produced in front, sides not dilatate, unarmed with spines, surface somewhat tuberculate, front bilobate, and not salient. Eyes rather remote and large, marginal. Buccal area neatly triangular. Third joint of outer maxillipeds triangular; palpus narrow, on outer side straight. Feet all short and stout, fingers opening nearly in a vertical plane, in the same plane with the articulation of the hand with the carpus.

#### NUCIA SPECIOSA.

*Carapax obesus, latere 5-6-tuberculatus, supra utrinque 5-6 tuberculis obsoletis ornatus, undique bene granulatus, postice areâ prominente tuberculisque juxta marginem duobus ornatus. Pedes perbreves, brachio parce exserto, digitis bene canaliculatis.*

Carapax obese, with five or six tubercles along either side, and above, either side of middle, five or six obsolescent tubercles; whole surface neatly granulate, behind having a prominent area, and below it on the margin two tubercles. Feet very short, arm sparingly exsert, fingers deeply channeled.



Plate 25, fig. 5 *a*, animal, enlarged three diameters; *b*, outer maxillipeds.

Sandwich Islands.

Length of carapax, 0·3 inch; breadth, 0·37 inch; or ratio, nearly as three to four. The eyes are unusually large for the family Leucosidæ. The front hardly projects as far forward as the epistome. The frontal lobes are rather large and deeply separated. A faint depression proceeds along the back of the carapax, either side of the middle, and passes either side of the posterior area. The tarsi are short pubescent. Outer maxillipeds in part pubescent.

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#### FAMILY IV. DORIPPIDÆ.

DORIPPUS SIMA, *Edwards*.

Singapore, East Indies.

*Dorippus sima*, EDWARDS, *Crust.*, ii. 157.

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#### TRIBE II. CRUSTACEA EUBRANCHIATA ANOMOURA.

THE relations of the Anomoura to the other Eubranchiata, have been discussed on pages 49 to 58, and we give here only a recapitulation of the grand divisions, with their subdivisions, making but a few preliminary remarks.

As the Anomoura constitute properly a transition group, between the Brachyura on one side and the Macroura on the other, there may be much doubt as to the proper limit in each direction. *Ranina* and *Dromia*, with some allied genera, are separated from the rest by De Haan, and placed with the Brachyura; while *Galathea* and *Grimo-*

thea, are taken from the Macroura, and associated in a common section with Porcellana. In both these particulars, this author differs from Edwards, by whom the tribe Anomoura was instituted.

Among the characteristics in which the Anomoura diverge from the Brachyura and graduate toward the Macroura, the position of the vulvæ is one of the most striking; and in this respect *Ranina* and *Dromia* are unlike the Brachyura: and as this characteristic is also sustained by others that bear a like impress of degradation, we think it more correct to refer these genera to the Anomoura. *Galathea*, on the other side, has strongly an Anomoural character, much like *Porcellana*, which it exhibits in its posterior pair of legs, short and inflexed beneath the carapax, and in the lateral suture of the carapax, — a Brachyural and not a Macroural characteristic. Still, these species, unlike all the Anomoura, have the abdomen complete in its pairs of members, and in all other particulars it is mainly Macroural. In *Æglea*, the posterior pair of legs and abdomen are as in *Galathea*, except that the abdominal appendages in the male are obsolescent. A lateral suture may be distinguished extending along by the lateral margin of the carapax; but there is another longitudinal suture, as in *Pagurus*, and in the *Thalassinidea* among the Macroura. The inner antennæ are posterior to the eyes, a Macroural characteristic, and not between them, as in *Porcellana*. The term *Anomoural* refers to the anomalous character of the abdomen; and when this part is not anomalous, it would seem plain that the species should be excluded from the tribe. Yet the existence of such a name, does not decide upon the true limits of the group so designated. After much deliberation, and still much hesitation, we incline to arrange these genera with the Anomoura. They are closely related to the *Thalassinidea*, and in either arrangement they are the osculant genera between the Macroura and the Anomoura.

We also refer to the Anomoura, with some doubt as to its propriety, the genera *Bellia* and *Corystoides*, which are Brachyural in most of their characteristics. The absence of interantennary fossettes, and the non-retractile eyes, are so decidedly Macroural traits, and so unlike the *Canceroids*, which otherwise they resemble, that we naturally rank them below any true Brachyura. They are inferior to the *Corystoidea* in these respects, and also differ from them strongly in the small or obsolete outer antennæ.

•The subdivisions of the Anomoura adopted are as follows:—



## SECTIO I. ANOMOURA SUPERIORA.

Oculi antennis 1mis non anteriores. Antennæ 2dæ oculis interdum posteriores non exteriores. Abdomen angustum, ad sternum sæpius appressum, appendicibus caudalibus non instructum.

Subtribus I. DROMIDEA (vel ANOMOURA MAIDICA SUPERIORA).—Carapax subtriangulatus vel subquadratus vel suborbiculatus, fronte angusto, oculis approximatis. Pedes postici subdorsales. Via efferens uti in Maioideis.

Subtribus II. BELLIDEA (vel ANOMOURA CANCRIDICA).—Carapax parce oblongus, subellipticus. Pedes 8 postici inter se similes. Via efferens uti in Dromideis.

Subtribus III. RANINIDEA (vel ANOMOURA LEUCOSIDICA).—Carapax oblongus. Via efferens osque uti in Leucosoideis.

## SECTIO II. ANOMOURA MEDIA.

Oculi antennis 1mis non anteriores. Antennæ 2dæ oculis posteriores et exteriores. Abdomen inflexum, sed non stricté appressum, appendicibus caudalibus instructum. Os nunquam uti in Leucosoideis.

Subtribus IV. HIPPIDEA (vel ANOMOURA CORYSTIDICA).—Carapax oblongus. Maxillipedes externi operculiformes, articulo 3tio elongato et lato. Pedes 2di 3tii 4ti natatorii, 5ti debilis inflexi.

Subtribus V. PORCELLANIDEA (vel ANOMOURA GRAPSIDICA).—Carapax suborbiculatum. Maxillipedes externi male operculiformes, articulo 3tio paulo minore quam 2dus. Pedes 2di 3tii 4tique gressorii, 5ti debiles, inflexi.

## SECTIO III. ANOMOURA SUBMEDIA.

Oculi antennis 1mis plane anteriores. Abdomen valde dilatatum,

inflexum sed stricté non appressum, appendicibus caudalibus non instructum.

Subtribus VI. LITHODEA (vel ANOMOURA MAIDICA SUBMEDIA).—Carapax subtriangulatus uti in Maiideis. Abdomen latum, vix symmetricum. Pedes nulli natatorii, 2dis 3tiis 4tisque inter se similibus, 5tis parvulis, sub carapace inflexis.

#### SECTIO IV. ANOMOURA INFERIORA.

Oculi antennis 1mis anteriores. Antennæ 2dæ oculis posteriores et exteriores. Abdomen elongatum, vix inflexum, appendicibus caudalibus instructum, sæpe appendicibus quoque ventralibus.

Subtribus VII. PAGURIDEA (vel ANOMOURA MAIDICA INFERIORA).—Carapax elongatus, postice mollior. Abdomen plerumque molle, appendicibus imparibus sæpius instructum. Pedes 3tii 4tis dissimiles.

Subtribus VIII. ÆGLEIDEA. — Carapax elongatus, texturâ omnino crustaceus. Abdomen extus crustaceum, in maribus, appendicium paribus obsoletis, in feminis elongatis, instructum. Branchiæ penicillatæ. Pedes 3tii 4tique similes, 5ti debiles sub carapace inflexi.

Subtribus IX. GALATHEIDEA. — Carapax elongatus, texturâ omnino crustaceus. Abdomen extus crustaceum, in maribus et feminis, appendicium paribus elongatis infra instructum. Pedes 3tii 4tique similes, 5ti debiles sub carapace inflexi. Branchiæ foliosæ.

An arrangement equally natural, may be based upon the type of structure in the species rather than their grade or rank. It is indicated above, and is as follows :

#### I. ANOMOURA MAIDICA.

1. DROMIDEA.—*Superiora*.
2. LITHODEA.—*Media*.
3. PAGURIDEA.—*Inferiora*.
4. ÆGLEIDEA.—*Macrourica*.



## II. ANOMOURA CANCRIDICA.

## 1. BELLIDEA.

## III. ANOMOURA CORYSTIDICA.

## 1. HIPPIDEA.

## IV. ANOMOURA GRAPSIDICA.

1. PORCELLANIDEA.—*Superiora*.
2. GALATHEIDEA.—*Inferiora* or *Macrourica*.

## V. ANOMOURA LEUCOSIDICA.

## 1. RANINIDEA.

The Corystoid Crustacea are properly degraded forms below the Cancroidea, and hence it is that the section A. Cancridica contains but a single group.

The Ægleidea are closely related in the sutures of the carapax to the Paguri, as is shown beyond; in their penicillate branchiæ, they look toward the Astacoid Macroura.

## SECTION I. ANOMOURA SUPERIORA.

## SUBTRIBE I. DROMIDEA.

THE known genera of living Dromidea, are as follows:—

1. *Antennæ internæ fossis instructæ.*

- G. 1. DYNOMENE, *Latr.*—Frons parce triangulatus, oculis approximatis. Pedes brevibus; 5ti abbreviati tantum, subdorsales.
- G. 2. DROMIA, *Fabr.*—Carapax suborbiculatus, fronte subtriangulato, angusto, oculis approximatis. Pedes crassi, breves; 4ti 5tique abbreviati, subdorsales.

2. *Antennæ internæ fossis non instructæ.*

G. 3. LATREILLIA, *Roux*.—Carapax elongatè triangulatum. Pedes longissimi, gracillimi, postici longi.

G. 4. HOMOLA, *Leach*.—Carapax subquadratus vel subellipticus, fronte angusto, oculis elongatis. Pedes longi, postici breves.

The genera *Cymopolia* and *Caphyra* also seem to be related to this division; since De Haan has shown a relation to the Maia group. But as we have not had an opportunity to examine specimens of either genus, we do not venture to decide upon their place in the system.

DROMIA HIRSUTISSIMA, *Lamk.*

Sandwich Islands, five inches in length. Also, Cape of Good Hope.

LAMARCK, *Hist. des An. sans Vert.*, v. 264; DESMAREST, *Crust.*, 137, pl. 18, f. 1; EDWARDS, *Crust.*, ii. 176.

## SUBTRIBE II. BELLIDEA.

THE only genera of this division are *Corystoides* of Lucas (*Crust. D'Orbigny's S. A.*, p. 31, pl. 16), and *Bellia*, Edwards (*Ann. des Sci. Nat.* [3], ix. 192, 1848).

## SUBTRIBE III. RANINIDEA.

THE known genera, as described, have the following characteristics:—

G. 1. RANINOIDES, *Edwards*.—Carapax oblongus, lævis, antice vix angustior, paucidentatus. Pedes 2di 3tii inter se remoti, postici fere filiformes, tarsis 4tis latis. Sternum inter pedes 2dos latum.

G. 2. RANINA, *Lamk.*—Carapax antice non angustior, fere rectangulatus, fronte



- truncato vel arcuato. Tarsi lati, postici 4tis vix angustiores. Antennæ externæ breves, articulo 2do processu auriculiformi instructo, 3tio cordiformi. Articulus maxillipedis externi 3tius 2do parce brevior. Sternum inter pedes 2dos lineare.
- G. 3. RANILIA, *Edwards*.—Carapax antice non angustior, fronte arcuato. Pedes uti in *Raninâ*. Antennæ externæ basi processu auriculiformi non instructæ, articulo 3tio crasso, cylindrico. Articulus maxillipedis externi 3tius 2do longior.
- G. 4. NOTOPUS, *De Haan*.\*—Carapax antice non angustior, margine antico lato, paucidentato, superficie fere lævi. Pedum 2dorum 3tiorum 5torumque tarsi angusti, pedibus 5tis parce minoribus.
- G. 5. LYREIDUS, *De Haan*.†—Carapax antice latera convergens, margine antero-laterali valde obliquo, rectiusculo, margine antico angustissimo. Pedum 2dorum, 3tiorum 5torumque tarsi angusti, pedibus 5tis parvulis, fere filiformibus.
- G. 6. COSMONOTUS, *White*.‡—Carapax plerumque uti in *Lyreido*. Pedes postici 4tis parce minores.

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RANINA SERRATA, *Lamk.*

Sandwich Islands.

*Cancer raninus*, LINN., Mus. Lud. Ulr., p. 130.

*Ranina serrata*, LAMK., Syst., 256, and Hist. des An. sans Vert., v. 225.

*Ranina dentata*, LATREILLE, Encyc. x. 268; EDWARDS, Crust., i. 194, pl. 21, figs. 1-4, and Cuv., pl. 41, f. 1; DE HAAN, Faun. Japon., p. 139, pl. 34, 35.

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SECTION II. ANOMOURA MEDIA.

SUBTRIBE IV. HIPPIDEA.

THE genera of Hippidea, thus far described, are distinguished as follows by Edwards:

ALBUNÆA, *Fabr.*—Antennæ externæ breves. Pedes antici subcheliformes.

ALBUNHIPPA, *Edw.*§—Antennæ externæ longæ. Pedes antici subcheliformes.

\* Faun. Japon., 136, pl. 35.

† Faun. Japon., 136, pl. 35.

‡ Voy. Samarang, 60, pl. 13, f. 3.

§ Arch. du Mus. d'Hist. Nat., ii. 474.—*Blepharipoda*, Dr. J. Randall, Jour. Acad. Nat. Sci. Philad., viii. 130.

REMPES, *Latr.*—Antennæ externæ breves. Pedes antici subcylindrici et non cheliformes.

HIPPA, *Fabr.*—Antennæ externæ longæ. Pedes antici non cheliformes, articulo ultimo laminato.

*Blepharipoda* of Randall is identical with *Albunhippa* of Edwards, and the two appear to have been described near the same time. Edwards's genus was published in 1839, and Randall's in January, 1840, although read before the Academy of Philadelphia in June of 1839.\*

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ALBUNÆA SPECIOSA.

*Carapax lineis transversim notatus, margine antico utrinque ferme 10-denticulato, cephalothoracis lateribus parallelis. Oculorum pedunculi graciles, attenuati. Margo articuli ultimi pedum quartorum anticus fere rectus. Segmentum caudale paulo oblongum, integerrimum, apice subtriangulatum, lateribus fere parallelis, parce arcuatis.*

Carapax marked with transverse lines, anterior margin either side of middle about ten-toothed, sides of thorax nearly parallel. Peduncles of eyes slender, attenuate. Anterior or upper margin of last joint of fourth pair of legs nearly straight. Caudal segment a little oblong, quite entire, at apex subtriangular, its sides nearly parallel, sparingly arcuate.

Plate 25, fig. 6 *a*, animal, natural size; *b*, front, enlarged three diameters; *c*, outer antennæ, enlarged two diameters; *d*, extremity of first pair of legs, *ibid.*; *e*, part of fourth pair, *ibid.*; *f*, caudal extremity, *ibid.*

Sandwich Islands.

Length of carapax, seven and a half lines; breadth, six and a half lines. The markings of the carapax are rather strong, and the edge adjoining each depression is set with extremely minute spinules. The peduncles of the eyes are not properly lamellar, but are quite narrow

\* See on these dates, Proc. Acad. Nat. Sci. Philad., for 1850, v. 29.



from the base and increasingly so towards the apex. The two are contiguous by their inner side, except at base; and between the bases of the two, in the semicircular excavation of the front, there is a small triangular piece; the centre of this excavation bears a minute tooth. The small teeth exterior to the eyes are about ten in number, with, in some cases, a minuter tooth intermediate.

ALBUNÆA SCUTELLATA, *Desmarest.*

San Lorenzo ?

Length of carapax of a female, six lines; breadth, seven lines; breadth of large or second abdominal segment, six lines; of fourth, five and a half lines; of fifth, one and one-fourth lines. These proportions are different from those in the figure by Edwards (Crust., pl. 21, f. 9), yet the species appears not to differ. The hand is very thin and high, the height being equal to the length; the lower margin is slightly arcuate, and not at all deflexed at the base of the immoveable finger; this finger is acute and short, the margin above it vertical and hairy. The front margin has a low median point, and also another equally advanced, half way to the side, with the margin between sinuous.

*Albunæa scutellata*, DESMAREST, Crust., p. 173; EDWARDS, Crust., ii. 204, pl. 21, figs. 9-13.

ALBUNHIPPA SPINOSA, *Edwards.*

San Lorenzo, Peru.

Length of carapax, one and one-fourth inches. The surface has a peculiarly smooth and almost porcelain polish.

*Albunhippa spinosa*, EDWARDS, Arch. du Mus. d'Hist. Nat., ii. 474, pl. 28.

The *Blepharipoda occidentalis* of Randall, from California (Jour. Acad. Nat. Sci., viii. 131, pl. 6), is another species of this genus, having the lower margin of the hand one-toothed near middle, and sharp three-toothed below the immoveable finger; moreover the margin of the carapax is very hairy.

## REMIPES PACIFICUS.

*Frons 4-dentatus, dentibus fermè æquis, externis vix prominentioribus, mediano nullo. Oculi parvuli. Antennæ 1mæ ferme dimidiî carapacis longitudine, flagellis inæquis, minore 10-articulato. Antennæ 2dæ 5-articulatæ, articulo 1mo latissimo, vix oblongo, 3tio longiore quam 2dus, 4to 5toque parvulis. Pedes antici parce pubescentes, apice setosi, articulo ultimo vix longiore quam penultimus.*

Front four-dentate, teeth very nearly equal, the outer scarcely more prominent, no median tooth. Eyes of moderate length, not shorter than base of first antennæ. First antennæ about half as long as carapax, flagella unequal, the smaller ten-jointed. Second antennæ five-jointed, first joint very broad, but slightly oblong, third longer than second, fourth and fifth small. Anterior feet sparingly pubescent, setose at apex, last joint hardly longer than penult.

Plate 25, fig. 7 *a*, animal, twice natural size; *b*, part of longer branch of inner antennæ, much magnified; *c*, mandible, enlarged, upper view; *c'*, same, under view; *d*, outer maxillipeds, enlarged two diameters; *e*, first pair of feet, *ibid.*; *f*, third pair of feet, *ibid.*; *g*, fifth pair, enlarged seven diameters.

Island of Ovalau, Feejee Group; Sandwich Islands; Samoan Group?

Length, one to one and one-fourth inches. General form, oval. Inner antennæ nearly two-thirds as long as carapax; of the basal joints observed, the penult is largest, broadest at apex, and hairy along the apical margin; the last oblong, in an upper view appearing slender, but wide in profile, and closing below the preceding; shorter flagellum about two-thirds as long as the other, joints ten, slightly oblong, having a few very short hairs at apex of each; longer flagellum consisting of numerous very short transverse joints, hairs on the inferior side longest, yet exceeding but little the diameter of the joints. Second or outer antennæ about half as long as inner, not seen in an upper view of the animal; first joint short pubescent on its inner margin; second, pubescent on outer side.

Exterior maxillipeds cover completely the mouth, the large joint



(third) not half longer than its breadth. First pair of legs have the second joint very large and broad, the remaining three oblong, the last longer than the other two, which are nearly equal. Last joint of second pair of legs short pubescent on the margin. Last joint of fourth pair slender, a little curved, short pubescent on inner side. Fifth pair terminates in a small, imperfect hand; the hand broadest at apex and truncate nearly transversely; the short finger closing against the terminal margin, and not quite as long as the margin; hairs about the extremity numerous, as long as the hand or even longer. This pair extends up into the branchial cavity.

No appendages to fourth abdominal segment (out of the six observed); those of first and second segments long filiform, and sparsely covered with long scattered hairs, a little curling; third pair slender but short; last pair as in Hippa. Anus situated at centre of last segment of abdomen.

The *Remipes marmoratus* of Hombron and Jacquinot (Voy. au Pole Sud., pl. 8, f. 22-26) has the outer antennæ very much more slender than in the *pacificus*.

#### REMIPES HIRTIPES.

*Carapax paulo latior, suturâ transversâ non notatus. Dentés 4 frontales obtusi, externi vix prominuliores, mediano fere obsoleto. Oculi parvi, paulo exserti, basi antennarum primarum valde breviores. Antennæ primæ fere dimidii carapacis longitudine, flagellis subæquis, setis flagelli minoris paulo longis. Pedes antici valde hirti.*

Carapax rather broader than in preceding species, not marked with a transverse suture near middle. Four frontal teeth obtuse, the outer hardly more prominent, a median tooth nearly obsolete. Eyes very small, but little exsert, much shorter than base of first antennæ. First antennæ about half as long as carapax, flagella nearly equal, setæ of smaller flagellum two or three diameters of the organ in length. First pair of feet rough and unevenly hairy.

Plate 25, fig. 8 *a*, animal, natural size; *b*, first antenna in profile; *c*, second antenna, under view.

From near the shores of a small island off Soung, the harbour of

the principal Sooloo island; found swimming along the sandy bottom in shallow waters.

Length, one and one-eighth inches. Colour, whitish, or cream-coloured. The eyes slightly project beyond the limits of the indentation, from beneath which they arise. The shorter flagellum of the first antennæ is ten-jointed, and the under side is furnished with hairs as long as two or three of the joints. The longer flagellum has short hairs about as long as the joints. The carapax has no transverse lines, and only two faint depressions, less than a line long, forward of the middle. In the two preceding species there are two transverse lines, one near the front, and one anterior to the middle, reaching between the same points as are here occupied by the faint depressions.

The base of the first antennæ was distinctly three-jointed; the second joint very short; the third broad in profile view, and having the upper side pubescent.

#### HIPPA EMERITA (*Linn*), *Fabr.*

Plate 25, fig. 9 *a*, front, with eyes and antennæ, enlarged six diameters; *b*, third joint of outer maxilliped, enlarged two diameters; *c*, last joint of anterior legs, enlarged six diameters.

Rio Janeiro.

This species is distinguished from the following by having a regularly triangular median tooth to the front, acute or nearly so, and the inner apex of the outer maxillipeds much prolonged, the elongation being as long nearly as its breadth at base. The form of the terminal joint of the anterior legs, appears to vary much, and affords no certain distinction, except it may be the absence of a tooth on the anterior margin of the joint.

*Cancer emeritus*, LINN.

*Hippa emerita*, FABR., Supp. Ent. Syst., 370; EDWARDS, Crust., ii. 209, and Cuv., pl. 42, f. 2.

#### HIPPA TALPOIDES (*Say*).

Plate 25, fig. 10 *a*, front, enlarged six diameters; *b*, third joint of



outer maxillipeds, enlarged two diameters; *c*, last joint of anterior legs.

Valparaiso.

The rounded median tooth of the front appears to be a constant character of this species. The inner apex of the third joint of the outer maxillipeds is produced, but is quite short, and the anterior margin of the last joint of the anterior legs has a small acute tooth towards the articulation. The prolongation of the apex of both the penult and antepenult joints, in these legs, is less than in the *emerita*.

*Hippa talpoida*, SAY, Jour. Acad. Nat. Sci., i. 160; GIBBES, Proc. Meeting of Amer. Assoc. at Charleston, 1850, p. 188.

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SUBTRIBE V. PORCELLANIDEA.

THE Porcellanidea pertain to a single genus *Porcellana*. Edwards, in his corresponding division, "Porcellaniens," embraces also the genera *Æglea* and *Megalopus*, yet expresses his doubts with regard to such an arrangement. The genus *Æglea* belongs properly to a lower grade of the *Anomoura* than *Porcellana*, inasmuch as the inner antennæ are posterior to the eyes, and, therefore, fall into our lowest section of the *Anomoura*, the *Anomoura inferiora*. The genus *Megalopus* has little actual relation to the Porcellanidea.

GENUS PORCELLANA.

The carapax in the genus *Porcellana* varies much in form and markings. The front is usually more or less triangular, and when straight in a view from above, there is often, if not always, a triangular outline when observed in a front view, so that the straight margin, in such cases, is owing to the front being deflexed. The surface may be entirely smooth. But commonly the front and posterior margin of

the median region are distinct, the former being seen in a small transverse elevation adjoining the medial line, and in a line with the post-orbital angles. There is generally an angle in the lateral margin a short distance behind the orbit, where there is sometimes a small spine, and this angle is in many species the termination of a depressed line, which passes inward and backward to the posterior limit of the median region, the whole evidently corresponding to the depression so common in *Grapsus*, and observed, also, in *Eriphia*; it appears to terminate just posterior to the first or second normal tooth (tooth D or E). In a few species there is a transverse depression in a line with the posterior side of the median region, as in our figures of the *P. tomentosa* and *monilifera*, especially in the former, and this depression terminates normally just anterior to tooth S. Rarely, as in the *spini-frons*, the surface is still more divided; the median region shows the intramedial areolet distinct from the extramedial, and is even subdivided partly into three parts in the usual way; moreover, some of the antero-lateral areolets are distinct. The system of areolets in the Porcellanæ, is evidently the same as in the Cancroidea. The sides of the carapax may be either rounded *without* a margin, or thin margined; and the margin may be entire, denticulate, or even spinulous in part, the last being the case in the *P. armata*.

The characters of the mouth and other organs are given in Edwards's work on Crustacea, and need not be repeated. One of the most remarkable peculiarities is the position of the outer antennæ, posterior and exterior to the eyes. The species live under stones along sea-coasts, near low-tide level, also in cavities among corals, &c.

I. FRONS SUPERNE VISUS RECTE TRANSVERSUS, NON TRIANGULATUS.

PORCELLANA BIUNGUICULATA.

*Purce transversus, valde convexus et subglobosus, lævis, fronte supernè viso recto. Pedes antici mediocres, carpo elongato, plus duplo longiore quam lato, integro, lævi, manu lævi, obsolete punctatâ, digitis manus majoris valde liantibus, superiore bene arcuato. Pedes sequentes nudi, tarso brevi, verticaliter valde biunguiculato (spinâ unguiculatâ vix breviorè quam unguiculum verum infra instructo).*

A little transverse, very convex and subglobose, smooth; front as seen from above straight. Anterior feet of moderate size; carpus more



than twice as long as broad, entire, smooth; hand smooth, absolutely punctate, wholly naked, fingers very much gaping, the superior quite regularly and largely arcuate. Following feet naked, or very nearly so, tarsus short, profoundly two-clawed (an unguiculate spine hardly smaller than the true claw, proceeding from the under surface of the tarsus).

Plate 26, fig. 1 *a*, animal, enlarged four diameters; *b*, larger hand (left), *ibid.*; *c*, front view of front; *d*, tarsus, enlarged.

Loc. — ?

Length one and a half lines. Unlike the *pisum*, which it resembles, it has a narrow, oblong, and entire carpus. The two claw-like terminations of the tarsus are in the same vertical plane, and each is about as long as the part of the tarsus preceding the claw. These legs are without hairs, excepting two or three at the extremity of the fifth joint. The upper side of the hand, including the upper finger, is arcuate in outline. The larger hand is not hirsute between the fingers at base, while the smaller is so, and, at the same time, the latter closes so that the fingers are nearly in contact. Looking at the front in a front view, it is seen to be pointed at middle, and rather prominently so.

PORCELLANA SCULPTA, *Edwards.*

Plate 26, fig. 2 animal, enlarged.

Island of Ovalau, Feejee Archipelago; also, Sooloo Sea, or Balabac Straits.

This thick, convex species has a bright red colour, with spots of white, or it may be wholly white. It is a little transverse.

EDWARDS, *Crust.*, ii. 253.

PORCELLANA PISUM, *Edwards.*

Sooloo Sea, coral reefs.

A small and very convex species, slightly broader than long. The hand is broad and short and has faint longitudinal sulci, with a slight rugosity. The fingers are widely gaping in our specimen. The carpus is slightly longer than broad, three-toothed within, the first tooth much the largest, and its surface is nearly smooth. Following legs very nearly naked.

*P. pisum*, EDWARDS, Crust., ii. 254.

2. FRONS PARCE SALIENS, TRIANGULATUS; CARAPAX LEVIS, NUDUS.

PORCELLANA MONILIFERA.

*Corpus paulo crassum. Carapax lævis, vix latior quam longus, fronte obsoletè triangulato, superne pubescente. Carpus latus, non oblongus, margine antico 3-dentatus, superficie supernâ 4 seriebus tuberculorum instar monilium confertis ornatus; manus lata et brevis, quoque seriatis tuberculosa. Pedes sequentes angusti, supra hirsuti.*

Body rather thick. Carapax smooth, hardly broader than long, front obsoletely triangulate, pubescent above. Carpus broad, not oblong, anterior margin three-toothed, upper surface with four crowded rows of tubercles looking like beads; hand broad and short, also seriatly tuberculous. Following feet narrow, hirsute above.

Plate 26, fig. 3, animal, enlarged two diameters.

Rio Janeiro; also, Raraka?

Length of carapax, 4·3 lines; breadth, 4·4 lines; length of carpus of larger leg, 3 lines, and breadth, 3½ lines, being broader than long. The proportions of the animal are nearly as in the *grossimana*. It is also near the *sculpta*; but the front is not straight transverse, and the anterior margin of the arm is three-toothed. These teeth are nearly equal (the basal longest), sparingly denticulate and minute tuberculate above. The tubercles of the carpus and hand look somewhat like ranges of beads. The moveable finger is also tuberculate; surface of hand under base of moveable finger densely hairy. The fourth and fifth joints of the fourth pair of legs are densely hirsute above; the



third joint is somewhat hirsute, and the second and third pairs of legs are similar.

PORCELLANA SULUENSIS.

*Carapax convexus, æque latus ac longus, non rugatus, sparsim crinitus, fronte fere recto, leviter triangulato; latere carapacis pone angulum post-orbitalem sed ante emarginationem antero-lateralem uni-spinoso, posteriore prope medium minutè tri-spinuloso. Pedes paulo hirtelli; antici mediocres, carpo oblongo, intus 2-3-dentato, dentibus tenuiter spinuliformibus.*

Carapax as long as broad, rather convex, not rugate, sparsely crinite, front nearly straight, faint triangulate, side of carapax behind the post-orbital angle but anterior to the antero-lateral emargination uni-spinose; more posteriorly, near middle, three minute spinules. Feet somewhat hairy, anterior of moderate size, carpus oblong, two or three teeth on inner margin, the teeth like slender spinules.

Plate 26, fig. 4, animal, enlarged four diameters.

Sooloo Sea, from a depth of six and a half fathoms.

Length and breadth of carapax, 1.4 lines. The specimen is evidently young, yet its characters are so far peculiar that we have felt warranted in naming and describing it. The hairs on the carapax are probably, to a great extent, due to its young state. It resembles the *grossimana* in the low triangular front, and is also near the *pisum*; but it is distinguished by the oblong carpus, with its two or three spiniform teeth, and the spinules on the lateral margin of the carapax, as well as that just behind the post-orbital angle. It is possible that on reaching maturity, the front becomes more inflexed, so as to present a straight profile in an upper view, as in the *pisum*, and others allied.

PORCELLANA GROSSIMANA, Guérin.

San Lorenzo, Peru; also, Valparaiso.

Length of carapax, six lines; breadth, six and one-third lines; breadth and length of carpus, three and one-fourth to three and a half lines. Colour, a fawn tint; also, other specimens from San Lorenzo, spotted with brownish black of different shades and a light red tint, carpus brownish, apex of fingers approaching vermilion. Carpus widest towards base, and having two teeth on its inner margin. Upper surface of both carpus and hand unevenly coarse granulous or minute tuberculous. Under surface of hand fine and even granulous. Third, fourth, and fifth joints of the following pairs of legs hairy above, and the fifth somewhat so below. Front of the carapax very short triangular, the sides being concave, and the surface above pubescent.

GUERIN, Mag. de Zool. for 1838, fig. 3, pl. 26.

*P. natalensis* (?) of KRAUSS, op. cit., p. 58, pl. 4, f. 1.

3. FRONS SUPERNE VISUS PROMINENTER TRIANGULATUS, NON DENTATUS.

a. *Carapax lævis, nudus.*

PORCELLANA VALIDA.

*Violaceæ et granulosæ affinis. Carapax fere lævis, utrinque obsolete marginatus, fronte planus, quoad marginem orbitâ paulo excavatus. Antennæ externæ flagello parce pubescentes, pilis latitudine flagelli longioribus. Articulus pedum 4-torum 3tius latus, 5tus paulo hirsutus, 4tus prope apicem parce hirsutus. Carpus manusque subtiliter granulati; manus superficie partim villosa.*

Near the *violacea* and *granulosa*. Carapax nearly smooth, with a minute margin either side, front plain, the front margin excavated by the orbit. Outer antennæ having the flagellum sparingly pubescent, the hairs longer than the breadth of the flagellum. Third joint of the fourth pair of legs broad, fifth a little hirsute, fourth somewhat hirsute about apex. Carpus and hand minute granulous; hand above partly villous.

Plate 26, fig. 5 a, animal, natural size; b, part of flagellum of outer antennæ, from near its middle.



## Valparaiso?

Length of carapax, 8·2 lines; breadth, 8·4 lines. Colour, dark brown with interrupted lines of brown and yellow, especially on posterior part of carapax. The species differs from both the *violacea* and *granulosa* in the hairs of the outer antennæ; it has the lateral margin nearly, the orbit, the granulous carpus and hands, and the hirsute extremity of the fourth pair of legs, of the *granulosa*; but the broad third joint of the same legs, the plane beak without a medial depression or furrow, are as in the *violacea*. The villous covering on the hand near its outer margin is also characteristic.

## PORCELLANA VIOLACEA, Guérin.

Plate 26, fig. 6 *a*, part of flagellum of outer antennæ, from near its middle, enlarged; *b*, extremity of leg, natural size.

Among stones, along the shores of the Bay of Valparaiso.

Length of carapax, 9·8 lines; breadth, 10·2 lines; ratio, 1 : 1·04. Colour, fine blue and purplish blue. The outer antennæ are long, and the flagellum is without hairs, excepting a few that are shorter than the joints and inconspicuous. The fourth joint of the second, third, and fourth pairs of legs is naked, and so also the fifth, excepting near tip, and a single range on the outer lateral surface in fourth pair; on the inner surface near lower margin there are three or four minute spines, the line terminating in one or two at the lower apex of the joint.

*Porcellana violacea*, GUÉRIN, Bull. Soc. Sci. Nat. de France, Séance du 23 Déc., 1835, p. 115; Mag. de Zool., 1838, p. 5, pl. 25, f. 2; EDWARDS, Crust., ii. 250.

*P. macrocheles*, PÆPPIG, Crust. Chili, Wieg. Arch., 1836, p. 142, pl. 4, f. 1.

## PORCELLANA GRANULOSA, Guérin.

Plate 26, fig. 7, part of flagellum of outer antennæ, from near its middle, enlarged.

Sandy beaches near Valparaiso.

Length of carapax, 6·4 lines; breadth, 6·9 lines; ratio, 1:1·08. The outer antennæ are as naked as in the *violacea*. The carpus and hand are fine granulous. The penult (fifth) joint of the second, third, and fourth pairs of legs is hirsute in tufts, and the fourth joint a little so; the third joint is much narrower than in the *violacea*. The colour of the species is dark brownish or bluish black, somewhat lined transversely.

*P. granulosa*, GUERIN, Bull. Soc. Sci. Nat. de Fr., 1835, p. 115, and Mag. de Zool., 1838, p. 6, pl. 25, f. 1.

*P. striata*, EDWARDS, Crust., ii. 250.

#### PORCELLANA ELONGATA, *Edw.*

New Zealand, Bay of Islands.

Length of carapax, 6·4 lines; breadth, 5·8 lines; ratio, 1:0·9. In our specimens, the tooth on the anterior margin of the carpus near its base is commonly acute, though sometimes obtuse. The outer antennæ are naked, the hairs being extremely short. The longitudinal depression of the beak is not deep. The fifth joint of the fourth pair of legs is hirsute, and the fourth somewhat so about apex. The third joint has a nearly smooth surface.

In another specimen, seven and one-fifth lines long, which appears to be of this species, the tooth on the anterior margin of carpus is obsolescent, and there is only one serrature on the posterior margin near apex. The third joint of the fourth pair of legs has the surface slightly rugulose.

*P. elongata*, EDWARDS, Crust., ii. 251; A. WHITE, Voy. Erebus and Terror, pl. 3, f. 3.

#### PORCELLANA SPECIOSA.

*Carapax depressus, lævis, parce oblongus, pone angulos post-orbitales*



*dente acuto instructus, superficie inter hos angulos paulo carinatâ, fronte undulato, paulo inflexo. Carpus leviter granulatus, intus inæqualiter 4 dentatus, extus versus apicem 2-3 serratus; manus minutè granulata, nuda. Articulus pedis 4ti 5tus gracilis, paulo compressus, sparsim pubescens.*

Carapax depressed, smooth, sparingly oblong, a short distance behind the orbit an acute tooth, surface between the post-orbital angles somewhat carinate either side of the medial line; front undulate, inflexed. Carpus fine granulous, on inner margin about four unequal teeth, on the outer towards apex two or three serratures. Hand minute granulous, naked. Fifth joint of fourth pair of feet slender, a little compressed, sparsely pubescent.

Plate 26, fig. 8, animal, enlarged two diameters.

Drummond Island (or Tapateouea), Kingsmills Group; Wakes Island, North Pacific; Mangsi Islands, Balabac Straits; Raraka, Paumotu Archipelago.

Length of carapax, 4.4 lines; breadth, 4 lines. Colour, yellowish or buff, with purple and orange dots; legs of same colour, excepting third and fourth joints of second, third, and fourth pairs, which are purple with some buff, and white on outer half of fifth joint. The carapax is slightly granulous or rugulose near the lateral margin. The outer margin of the carpus is somewhat raised and granulato-serrulate, becoming serrulate near apex. There are sometimes five teeth on the inner margin of the carpus, though usually but four. The beak is rounded at extremity, and the apical portion is flexed downward a little more than the preceding part.

This species has the tooth behind the orbital angle which characterizes the *maculata*, but it is not "bombée;" the beak is not nearly horizontal, and the carpus has four instead of two or three teeth on the inner margin. The third joint of the fourth pair of legs is twice as broad as the fifth joint. The hands are granulous on both surfaces. The outer antennæ are about three times as long as the carapax.

PORCELLANA DENTATA? *Edw.*

Specimens from the Paumotu Archipelago (Waterland, Raraka, Carlshoff, and other islands), lost with the wreck of the Peacock, are mentioned as follows, in the author's note-book, and may pertain to the *P. dentata*.

"Colour, dark brownish purple to brownish blue and dark ash-brown; fine dark blue to purple below. Beak triangular, rounded, having a deep longitudinal furrow above. Carpus with *four* serratures."

## PORCELLANA MITRA.

*Carapax laevis, depressus, orbiculato-ovatus, anticè triangulatus et minutè denticulatus aut spinulosus, margine orbitâ non excavato. Pedes antici graciles, scabriculi; manus perangusta; carpus oblongus, intus subacutè 2-dentatus; brachium apice instar spinæ productum. Pedes sequentes superficie scabriculi, nudi.*

Carapax smooth, depressed, round-ovate, triangulate anteriorly and margin minutely spinulous or denticulate, not excavated by orbit. Anterior feet slender, somewhat scabrous; hand very narrow; carpus oblong, having two narrow pointed teeth; arm produced at apex into a spine or tooth. Following feet with the surface scabrous, naked.

Plate 26, fig. 9 *a*, animal, enlarged; *b*, extremity of abdomen.

Island of San Lorenzo, Peru, under stones at low tide.

Length, two and a half lines. Colour, dark and dull violet, with a longitudinal whitish band along the middle of the back of the thorax, and also of the abdomen. The outline of the front is directly continuous with that of the sides, without any notch or emargination, and the margin is entire, except the minute spines or denticulations; it



is nearly acute in front and truncate behind. Outer antennæ somewhat longer than the body, flagella nearly naked.

b. *Carapax tomentosus aut pubescens, et non nudus.* [*Frons fere trilobatus.*]

PORCELLANA TOMENTOSA.

*Carapax pedesque sparsim tomentosi. Carapax paulo oblongus, paulo pone oculos spinâ lateraliter instructus, fronte subito angustiore quam latitudo interorbitalis, eoque trilobato, lobo mediano triangulato, rotundato, externo rectangulato obtuso; superficie carapacis antierius colliculo transverso utrinque notatâ, regione medianâ postice circumscriptâ. Pedes antici parvi, carpo oblongo, intus acute tenuiterque 4-5-dentato; manu elongatè triangulatâ, valde depressâ.*

Carapax and feet sparsely tomentose. Carapax oblong, having a short spine a short distance behind the eyes; front abruptly narrower than interorbital breadth, and hence trilobate, median lobe triangular, rounded, the outer rectangular, and not projecting forward, obtuse; surface of carapax having a transverse prominence either side of median line, just posterior to line of orbits, median region circumscribed behind. Anterior feet small; carpus oblong, and having four or five slender acute teeth on inner margin; hand long triangular, and very thin.

Plate 26, fig. 10, animal, enlarged two diameters.

Raraka Island, Paumotu Archipelago.

Length of carapax, 3·2 lines; breadth, 2·7 lines. From the lateral spine of the carapax a depression passes inward and backward, and a connecting line forms at middle the posterior limit of the median region. The hands are about as long as the breadth of the carapax, and very thin. The orbit makes a semicircular depression in the margin of the carapax. Of the five teeth of the carpus in our specimen, the middle one is much smaller than the others, and the fifth is next smallest; there are six teeth, counting the one at the apex on the same margin.

e. *Carapax transversim rugatus*.

PORCELLANA BOSCHII? *Savigny*.

Plate 26, fig. 11, animal, natural size.

Rio Janeiro; found among serpulæ along rocky shores.

Length of carapax, three-fourths of an inch to one inch. Colour, deep cherry-red, paler at the base of the ridges. Beak prominently triangular, obtuse. Ridges of carapax and legs finely ciliated, those of the hand and carpus slightly crenulate. Carpus with four large denticulate serratures on the anterior margin, and outer margin of upper surface furnished with a few short spines. Hand broad and large (nearly twice as wide as carpus), with outer edge finely serrate, moveable finger with apex much prolonged and incurved, densely villose beneath. Following pairs of legs thin hairy, third joint ciliate on anterior margin. Basal joint of outer antennæ quadrate anteriorly and having angles acute and a little divergent; second joint cylindrical, length, more than three times that of the carapax. In our specimen, the ridges of the carapax are continued uninterrupted or nearly so across the medial region, while they are represented as much broken in the *Boschii*. The *rugosa* of Edwards is described as having five or six teeth to the anterior margin of the carpus.

*P. Boschii*, SAVIGNY, Crust., Egypt, pl. 7, f. 2.

4. FRONS TRIDENTATUS.\*

PORCELLANA PUNCTATA (*Guérin*).

San Lorenzo.

\* The lateral teeth of the front are either near the medial, or else distant and over the eyes. By losing their prominence, they pass gradually into species having a simply triangular front. *P. tomentosa* is intermediate, it having lateral lobes, but the front of these lobes is transverse and not salient, tooth-like.



Length, 6 lines; breadth, 6·1 lines, being greatest a little anterior to the middle.

*P. punctata*, GUERIN, Bull. de la Soc. des Sci. Nat. de France.

*P. cristata*, EDWARDS, Crust., ii. 254.

#### PORCELLANA TUBERCULATA, *Guérin*.

Valparaiso, Chili; San Lorenzo, Peru.

Length of carapax, 5·4 lines; breadth, 5·7 lines. Colour, brownish red with a tinge of purple; the prominent surfaces of the carapax blue with a purplish tinge; purplish below. The surface of the carapax is short downy, like the *tuberculifrons*, excepting the low prominences. The front has three nearly equal and similar points, each with a small tubercle above. The carpus has five or six denticulate teeth, rather broad and partly rounded; and there is a row of small tubercles or granules some distance from the posterior margin.

*Porcellana tuberculata*, GUERIN, Bull. de la Soc. des Sci. Nat. de France, Séance du 23 Dec., 1835, p. 115, and Mag. de Zool., 1838, p. 6, pl. 26, f. 2.

*P. lobifrons*, EDWARDS, Crust., ii. 256.

#### PORCELLANA TUBERCULIFRONS, *Edwards and Lucas*.

Valparaiso.

Length of carapax, fourteen lines; breadth, fifteen lines. The surface of the carapax is more even than in the *tuberculata* of Guérin (*lobifrons*, Edwards); the middle lobe of the front has two small tubercles above instead of one, and the outer lobes are subquadrate; the carpus has but two or three large teeth, and quite near its posterior margin there is a range of small tubercles. The carapax and legs have the surface short villous.

*P. affinis*, GUERIN, Bull. de la Soc. des Sci. Nat. de France, Séance du 23 Dec., 1835, p. 116, and Mag. de Zool., 1838, p. 6.

*P. tuberculifrons*, EDWARDS and LUCAS, D'Orb. Crust. S. A., 33. The name *affinis* was previously applied to another Porcellana by Gray.

PORCELLANA COCCINEA, *Owen*.

Sandwich Islands, island of Maui.

Length of carapax, 7.1 lines; breadth 7 lines, or slightly less than length, although the body looks oblong. The beak is prominent triangular, with a small tooth either side over the base of the eyes; the post-orbital angle is acute, and there is a short spine on the side of the carapax, a short distance posterior to the orbit, besides two or three denticulations between this spine and the angle of the orbit. Posterior to this spine there are no others on the sides of the carapax. The carpus in our specimen has three oblong teeth on the inner margin, exclusive of the inner apical angle. The third joint of the second, third, and fourth pairs of legs is laterally short hirsute, and the upper margin is spinous. The hand is minutely squamato-granulous. The rugosity of the carapax is faint, though distinct with a lens. The flagellum of the outer antennæ is naked. Under a lens, the triangular beak is a little denticulate either side, near the lateral tooth, where it is somewhat dilated, and just above there is a prominent point. The body is depressed and rather thin; the hand is thin.

*P. coccinea*, OWEN, Crust. of the Blossom, p. 87, pl. 26, figs. 1, 2. The specimens described by Owen, were from the Paumotu Archipelago.

## PORCELLANA ANGUSTA.

*Carapax multo oblongus, nudus, lævis, leviter rugulatus, fronte œque tridentato, dentibus triangulatis, margine antero-laterali acutè unidentato, posteriore integro. Pedes antici gracillimi, manu angustolongatâ, fere lineari, compressâ, digito inferiore infra pubescente, carpo oblongo, fere integro. Pedes 6 sequentes nudi aut nudiusculi; postici sub carapace celati.*

Carapax unusually oblong, naked, smooth and shining, faintly rugulate, front with three equal triangular teeth, antero-lateral margin with a single acute tooth some distance behind the eyes; margin behind this entire. Anterior feet very slender, hand narrow elon-



gate, nearly linear, compressed, lower finger pubescent below, carpus oblong, nearly entire. Six following feet naked or nearly so; posterior pair concealed under the carapax.

Plate 26, fig. 12 *a*, animal, enlarged eight diameters; *b*, outer maxillipeds; *c*, extremity of abdomen.

Rio Janeiro, Brazil.

Length, one and a half lines; breadth, nearly a quarter less than the length. Tarsus much curved and naked. The medial tooth of the front is very slightly the largest, and its sides are not quite even. The carpus has one or two very minute serratures on anterior half of inner margin. The posterior legs were not in sight in any of the specimens. The caudal segment is triangular and nearly equilateral, the length slightly exceeding the breadth at base; the appendages either side are narrow oblong, with the articulation of the pair adjoining the caudal segment, situated just by the apex of the triangle; and the outer lamella does not reach beyond this articulation.

#### 5. FRONS 5-7 DENTATUS.

#### PORCELLANA SPINIFRONS, *Edwards*.

Valparaiso, Chili; San Lorenzo, Peru.

Carapax a little oblong, embossed. Colour, fine brownish red spotted with brownish black; specimens from San Lorenzo vary from deep olive-green to brownish black, with a violet tinge, legs brownish violet. The legs are naked, and the carapax shining, though finely embossed.

EDWARDS, Crust., ii. 256.

#### PORCELLANA SCABRICULA.

*Carapax depressus, parce oblongus, transversim leviter rugatus et partim subtiliter hirsutus, fronte prominenter lateque triangulato, supra oculos*

*duobus minutis dentibus acutis armato, et anterieus 2-3-denticulato, latere carapacis prope medium tri-spinuloso, pone angulum post-orbitalem dente acuto, et posterius in superficie carapacis altero simili. Pedes antici mediocres, rugati et scabriculi, carpo elongato, intus 4-dentato dentibus fere æquis, extus juxta marginem spinulis seriatis ornato, manu tenui, ad marginem externum hirsutâ. Pedes sequentes sparsim criniti, articulo tertio supra 3-4 spinuloso.*

Carapax much depressed, sparingly oblong, transversely faint rugate, and in part minute hirsute; front prominently and broadly triangular, above the eyes a small acute tooth, and another just anterior to this, and still more anterior two or three denticulations; sides of carapax near middle with three spines, behind the post-orbital angle an acute tooth or spine, and another posterior to this on the surface of the carapax. Anterior feet of moderate size, rugate and somewhat scabrous, carpus oblong, having four acute, nearly equal teeth within, and on upper surface near outer margin a series of spines; hand thin, at outer margin hirsute. Following pairs of feet sparsely hairy, third joint with three or four spinules on the upper margin.

Plate 26, fig. 13, animal, enlarged three diameters.

Sooloo Sea.

Length of carapax, 2.4 lines; breadth, 2.1 lines. The beak is without lateral lobes, the triangle occupying the whole breadth; yet there are two teeth near either eye, which place the species near the *spini-frons*, although the spines are smaller than in that species. The lateral spines are in all five on either side, posterior to the post-orbital angle; the *first* is situated just behind the antero-lateral emargination, and not anterior to it; the *second* is behind the first, a little distance from the margin; the other three are marginal, or nearly so. The teeth of the arm are nearly as broad as long, and acute. The upper surface of the hand has the upper and lower parts of the outer surface meeting in an angle, along a line reaching from the base to the articulation, and either part is rugate or pseudo-squamate.



## PORCELLANA ARMATA.

*Carapax lævis, subgranulosus, non areolatus, paulo convexus, oblongus, lateribus prope medium trispinosus et pone angulum post-orbitalem unispinosus, fronte 7-dentatus.*

Carapax smooth, subgranulous, not at all areolate, little convex, somewhat oblong; sides of carapax having three acute spines near middle and one just behind post-orbital angle; front seven-toothed.

Plate 26, fig. 14, carapax, enlarged four diameters.

Mangsi Island, Balabac Passage, north of Borneo.

Length of carapax, two and one-fourth lines; breadth, two lines. The specimen is much mutilated in its limbs; yet, its distinctive characters are well pronounced in the carapax. The middle tooth of the front is also mutilated; of the others, the pair next to the medial tooth is broader and subacute; the other two are spiniform and acute, one of the spines being at the margin of the orbit, and the other more interior. The upper margin of the orbit is thin, and somewhat reflexed; its outline excavate. The tooth behind it is between the post-orbital angle and an indentation of the side of the carapax. The posterior margin of the carapax is straight.

## SECTION III. ANOMOURA SUBMEDIA.

## SUBTRIBE VI. LITHODEA.

THE tribe Lithodea contains three genera, *Lithodes*, Latreille; *Lomis*, Edwards; and *Echinocerus*, White.

In *Lomis*, the beak is nearly rudimentary, the surface is tomentose, and the fifth joint of the outer maxillipeds, according to De Haan,\* very broad (twice as broad as the fourth).

*Lithodes* has a distinct spinigerous beak, a spinous or verrucose carapax, and the fifth joint of the outer maxillipeds oblong and seldom wider than the fourth.

The genus *Echinocerus* of A. White, was proposed for a species from the Columbia River. From the description he has given,† we are unable to determine in what generic characters it differs from *Lithodes*.

#### GENUS LITHODES.

The species of *Lithodes* hitherto described are the following:—

1. *L. Maia*, figured by Pontoppidan, Hist. Nat. de la Norwege, ii. pl. 25; *Cancer maja* of Linnæus, Herbst; *L. Maia* of Leach; *L. arctica* of Lamarck, Edwards (ii. 186), &c.
2. *L. Camschatica* of Tilesius and De Haan (Faun. Japon., 217, pl. 47).
3. *L. hystrix*, De Haan (Faun. Japon., 218, pl. 48); *L. arctica* of Siebold (*Spicilegia*, Faun. Japon., 15).
4. *L. antarctica*, Hombron and Jacquinot (Voy. au Pole Sud, pl. 7).
5. *L. granulosa*, Hombron and Jacquinot (ibid., pl. 8, f. 15).
6. *L. brevipes*, Edwards and Lucas (Arch. du Mus. d'Hist. Nat., ii. 463, pl. 24-27).

The first three are from the northern seas; the last three from the southern. To these we add the *L. verrucosa*, another Fuegian species.

#### LITHODES ANTARCTICA, Hombron and Jacquinot.

Nassau Bay, Fuegia.

Plate 26, fig. 15, represents the abdomen of a large female, natural size.

The species grows to a very large size; specimens are often five inches

\* Faun. Japon., p. 215, pl. Q, and pl. 48, f. 2, *Lomis dentata*, De Haan.

† Ann. Mag. Nat. Hist. [2], iii. 225.



long, with a breadth of four and one-third inches, the longest legs being nine and a half inches long. The exuvia of one, procured by us, was eight inches in length, with the longest legs fifteen inches in length. The species is abundant, and is found in six or seven feet water, where it is observed to creep along the bottom with sluggish motion; they have no legs or appendages fitted for swimming. Colour, dark cherry-red, the carapax with a slight purplish tinge. The long spines that cover the carapax and legs are longest proportionally in small individuals. Eye small, the cornea situated a little to one side of extremity of pedicel; there is a short process to apex of pedicel beyond cornea. Whole length of outer antennæ about half that of the carapax. Right hand much the stoutest. Second basal joint of outer antennæ with a single longish spine on outer side.

#### LITHODES VERRUCOSA.

*Carapax omnino verrucosus, margine antero-laterali 12-15-dentato, rostro breviter trispinoso, paulo superante spinam extra-orbitalem. Antennæ externæ breves, articulo secundo extus valde dilatato et 4-5 spini-dentato. Pedes toti breves et undique verrucosi, carpo intus triangulate dilatato, 6-dentato, dentibus paulo hirsutis, manibus subtuberculatis, digitis hirtis; pedum sequentium articulis 3tio 4to 5toque supra dentatis, dentibus scabris.*

Carapax verrucose throughout, antero-lateral margin 12-15-dentate, beak short three-spinose, projecting but little beyond the extra-orbital spine. Outer antennæ short, second joint superiorly much dilated, and with four or five spreading spiniform teeth. Feet all short and verrucose; carpus triangulately dilated at inner margin, and with six teeth which are a little hirsute, hands subtuberculate, fingers rough hairy; third, fourth, and fifth joints of following six legs dentate above, the teeth scabrous.

Plate 26, fig. 16, animal, natural size.

Fuegia.

Length of carapax of a male, one inch and seven lines; greatest breadth, one inch six and a half lines; right hand the larger, one

inch long, and half an inch wide; carpus, half an inch long, and nearly eight lines wide to top of medial spine on inner margin. The warts of the surface are very unequal; but none are over a line in breadth; they have a crenulate border, or a subradiate appearance, as in the enlarged figure. The fingers, as usual in the genus, are excavate and have corneous tips. The abdomen is verrucose on the outer surface throughout like the carapax.

The *granulosa* of Hombron and Jacquinet, according to the figure, has the beak projecting scarcely at all beyond the extra-orbital angle; the carpus is oblong and triangulately dilated within, and the fingers are hardly hairy. They have as yet published no description.

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#### SECTION IV. ANOMOURA INFERIORA.

AMONG the Anomoura of this the lower section, we find a transition in the structure of the carapax to the Macrourea, which it is of some interest to trace out. We have remarked elsewhere upon the differences in the sutures of the Brachyura and the Macrourea; that the former have a longitudinal suture on the lower surface of the carapax, between the legs and outer margin, and the latter a transverse dorsal suture, with sometimes (as in the *Astaci*), traces of longitudinal dorsal sutures posterior to the transverse suture. In this division of the Anomoura, the transverse dorsal suture of the carapax is strongly marked in the Paguridea and *Ægleidea*, though faint or wholly wanting in the Galatheidea. The lateral longitudinal suture of the Brachyura exists in Galathea distinctly; it is less distinct, although apparent, in *Æglea*, and is wanting wholly in many Paguridea; while the dorsal longitudinal sutures are strongly drawn in both the *Ægleæ* and the Paguridea. The Galathæidea, it should be remembered, are in most of their characters more decidedly Macroureal than either of the other groups, although wholly like the Brachyura in the sutures of the carapax.

These points, and others of equal interest, will be more clearly apparent from an examination of figures; and we refer, for further



illustration, to figures of *Pagurus punctulatus*, and *Æglea*, on Plate 28, and species of *Galathea*, on Plate 30.

In the Galatheæ, it appears that the dorsal transverse suture is only indicated by a faint depressed line, and may be wholly wanting; and the only distinct suture is a longitudinal below, on either side.

In the carapax of the *Pagurus punctulatus* (fig. 4 *a*), the transverse dorsal suture, *d*, is very distinct and open, being occupied by a corneous membrane; it is continued forward along *d'*, either side to *m*, and (fig. 4 *b*) extends to the front margin, at the base of the outer antennæ (*m*). But from *d'* there is a branch suture passing laterally and downward to *n*, so as to separate a piece lettered S in the figures; as this suture descends it loses its distinctness, and is not more prominent than several other sutures that divide the lateral portions of the carapax in this part into several narrow stripes, that are more or less subdivided by cross sutures. The dorsal suture of the carapax divides it into an anterior (A) and posterior (P) region. In the former, near its middle, there is a U-shaped suture, lettered *u u*. This suture is distinct and a little open in the *punctulatus*, and is connected posteriorly by a medial suture with the dorsal.

In the Calcini, the U suture is only faintly indicated, and in the Cenobitæ it is not at all apparent.

In the posterior region of the carapax, the two dorsal longitudinal sutures (*p p*) are distinct in all the Paguridea, as seen in fig. 4 *a*. Besides these, there is in the *punctulatus* another longitudinal suture either side, less distinct, marked *l* in figures 4 *a* and 4 *b*. This last is, apparently, the analogue of the longitudinal suture in the Brachyura. In figure 4 *b*, it is observed, that there is no other lateral suture corresponding to the Brachyural. This suture, *l*, extends by *l''* to the angle in the transverse dorsal (*d*); but there is also another continuation of it, *l'*, which reaches to *d'*, near the commencement of *d' n*, and an area, *r*, is included by these sutures.

The fact that the suture *l* is less distinct than *p*, the dorsal longitudinal, shows that the Macroural is beginning to preponderate over the Brachyural structure. In Cenobita, the suture *l* is wanting, or only appears for a short distance to be lost entirely as it proceeds backward, while the dorsal, *p*, remains distinct.

The surface included by the U suture appears to correspond to the medial region in the Brachyura (see page 29), and faint depressions near the eyes appear to mark the anterior limits of this region, corre-

sponding to the anterior and outer side of 2 M. The area between the sutures  $p p$ , is analogous to the cardiac and intestinal area. Outside of  $u u$ , between  $u$  and  $d'$ , there is a faint depressed line running forward and outward, and finally bending more outward, so as to reach  $d'$  at the margin adjoining the piece S anteriorly. The space between  $u$  and this depressed line may correspond to 6 L, 5 L, (p. 29), but it is more probable that the whole space from  $v$  to  $d'$  has this relation. In either case, the piece S may correspond to the normal tooth or lobe S, and the suture  $d' n$ , may be the equivalent of the line between 1 R and 2 R (p. 29), while  $l''$  may correspond to that between 2 R and 3 R.

We thus trace out many of the regions of the Brachyural carapax in the carapax of this Pagurus, while, at the same time, we show the strong influence of a Macroural character.

*Æglea* affords similar facts (see fig. 6, Plate 30), and it is not a little remarkable that the sutures should be throughout almost identical with those of the Pagurus described. The transverse dorsal ( $d$ , fig. 6 *b*) is strongly marked. Either side, it bends forward, taking the course of  $d'$  towards the margin, and thence there is a continuation forward ( $m$ , fig. 6 *c*) to the base of the outer antennæ, precisely as in Pagurus. Moreover, there is also another suture ( $n$ ), passing laterally and downward from  $d'$ , and thus separating a piece S, as in Pagurus. The anterior region of the carapax has the same U depression, and depressed lines terminate either side in the margin at the anterior side of S.

The correspondence is thus far exact; and it is hardly less so in the posterior region of the carapax. The two dorsal longitudinal sutures  $p p$ , are as in Pagurus, only a little more distant. There is a lateral longitudinal suture which follows near the lateral margin, running backward from the piece S, as if a continuation of  $m$ ; it lies above the margin of the carapax for much of its course backward, and then passes below this margin to the posterior margin, like the lateral suture in the Brachyura. Where it is below the margin, it forms an angle and receives another suture ( $o$ ) running obliquely from the edge. The suture  $l$  is continued to the angle between  $d$  and  $d'$ , as well as to  $s$ , in exact parallelism with what has been described of the Pagurus, although the piece  $r$ , thus included, is of very different shape in the two.

The U suture is again the posterior limit of the median region, and



the lines running laterally from the anterior part of the U, are apparently equivalents to the front margin of 5 L, 4 L (p. 29). The surface between *u* and *d'* is here also the same with 5 L, 4 L; and S is the analogue of the normal tooth or lobe S. That this last is true, is further probable from the teeth of the margin. The extra-orbital tooth, judging from the distance to the next tooth, may correspond normally to D and E, which teeth are often coalescent; then the three following teeth will be in order N, T, S. The suture *l''* has the position and relations of the depression between 2 R and 3 R (p. 29) much more exactly than in the Pagurus, owing to the more nearly Brachyural form of the carapax, and the area *r* is much like the areolet 2 R; while the suture between *r* and S may be that between 1 R and 2 R.

There is, therefore, a striking parallelism between the lines and markings of the carapax of these two Anomoural forms, and between them and the Brachyural carapax. It is a fact of importance also, that the lines which are mere depressions of the surface in the latter become actual sutures in the former. It is also of special interest that both the Brachyural and Macroual lines or sutures are here combined in the same species. The more minute relations to the Macroua will properly come under consideration in our remarks on that tribe of Crustacea.

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#### SUBTRIBE VII. PAGURIDEA.

THE Paguridea include two groups, distinguished by the inner antennæ, outer maxillipeds, and some other characters, the one *aquatic* and the other *subterrestrial* in habit.

1. PAGURIDÆ.—Inner antennæ short, the first joint very short. Outer maxillipeds having a multiarticulate flagellum to the palpus. Habit aquatic or littoral.

2. CENOBITIDÆ.—Inner antennæ very much elongated, the first joint as long as the eyes or longer, and bent obliquely downward. Outer maxillipeds having no flagellum to the palpus. Habit subterrestrial.

The Paguridæ have hitherto been divided into but two genera, *Pagurus* including the species with an unsymmetrical or one-sided abdomen, and *Cancellus*, of Edwards, those with a symmetrical abdomen. There are, however, important characteristics which point to a division into other groups. These have been partly indicated by Milne Edwards in his subdivisions of the genus *Pagurus*, in his work on Crustacea,\* and more distinctly in the *Annales des Sciences Naturelles*, for July, 1848.† In the latter article, there are, in certain instances, discrepancies between the character of the species and those laid down for the subdivisions, which we find it difficult to reconcile, such as the placing of *P. tibicen*, and some related species, with his "Æquimañes," when the left hand is very much larger than the right, and the *guttatus* and *granulatus*, with the "Senestres," although, in the former, the hands are as nearly equal as in many of the "Æquimañes," and in the latter, the *right* hand (as stated in his *Crustacés*, and in fact) is actually the larger. Yet, his sections are, in the main, natural groups, and some of them have more important points of distinction that he has mentioned.

The *Pagurus Bernhardus* is the type of one of these groups; and, besides being usually "dextres," or right-handed, as made in the arrangement just alluded to, they are peculiar in having acuminate fingers, with calcareous tips on the larger hand; and, although the fourth pair of feet are subcheliform, the scabrous area or rasp of the hand is confined nearly to the posterior edge, in these species; and, also, the species are mainly inhabitants of cold waters, while the ordinary Paguri live in warm water, and abound in the tropics. All the Paguri of England are of the *Bernhardus* type, with a single doubtful exception; those of the northwest coast of America are the same: we naturally, therefore, distinguish this group as a genus, under the name BERNHARDUS.

Among the remaining Paguri, the larger part have the fourth pair of feet subcheliform, terminating in a small broad hand, with the tarsus placed on the anterior margin of the hand, forming a finger. Yet, there are a few in which these feet are vergiform, and the tarsus is terminal, as in the preceding pairs of legs. These, moreover, have two pairs of appendages at the base of the abdomen below: the species are the "Pagures appendicules" of Edwards. They are also peculiar in

\* *Crustacés*, ii. 213; see also *Annales des Sci. Nat.* [2], vi. 257.

† *Annales des Sci. Nat.* [3], x. 59.



having the flagellum of the outer antennæ more or less hairy, and often long ciliate, and also the inner antennæ are longer than the eyes, the second basal joint reaching to the extremity of the eye-peduncle. So many peculiarities warrant us in placing the species in a distinct genus, which we name PAGURISTES.

Another small group is peculiar in having a rostriform appendage to the ophthalmic joint; they are the "Pagures armés" of Edwards, including *P. miles* and *P. custos*. Besides this, the fingers of the hand are acuminate, as in *Bernhardus*, and calcareous at tip, yet the species are not right-handed as in that group. Of these we make the genus DIOGENES.

The other species are similar in having the fingers of the hands more or less spoon-excavate; no rostriform appendage to the ophthalmic segment between the eyes; the basal part of the outer antennæ furnished above with a moveable acicle; the flagellum of the outer antennæ naked or nearly so; the inner antennæ never exceeding the length of the eyes by the length of the third joint; the fourth pair of feet subcheliform, with the scabrous area on the hand lateral and broad. The great majority of these species, large as well as small, have the tips of all the fingers corneous. But a few have these tips in the larger hand *calcareous*, besides being peculiarly smooth in the appearance of the limbs, and naked or nearly so. These have the left hand much the larger; yet, unlike the strongly left-handed species with corneous tips, the front margin has a small salient point at the middle, like most equal-handed species with corneous tips. Of the species with calcareous tips to the fingers, we make the genus CALCINUS. Of the remainder, part have the fingers opening vertically, while a well-characterized group have them opening horizontally; the former have the hands usually very unequal, and in general a truncate front, while the latter have nearly equal depressed hands, and a small rostrum or triangular median point to the front. The latter constitute the group CLIBANARIUS, and the former include the groups PAGURUS and ANICULUS. The former (*Paguri*) have the front truncate, without any appearance of a median point, while the latter (*Aniculi*) have a prominent point or rostrum, besides subequal hands. Aniculus forms the passage between Pagurus and Clibanarius; the general habit is that of the latter, while the fingers have the vertical motion of the former.

The following are the genera, with their characteristics:—

## FAM. I. PAGURIDÆ.

Antennæ internæ mediocres, articulo 1mo brevissimo. Maxillipedis externi palpus flagello multiarticulato instructus.—Species aquaticæ vel littorinæ.

## 1. PAGURINÆ.—Abdomen asymmetricum.

1. *Digiti acuminati. Flagellum antennarum internarum sæpe plus minusve pilosum.*

G. 1. PAGURISTES (*D.*)—Pedes 4ti non subcheliformes, tarso terminali. Corpus 2—4 appendicibus pone pedum posteriorum bases instructus. Basis antennarum internarum paulo longior, apice articuli 2di extremitatem oculorum fere attingente.

G. 2. DIOGENES (*D.*)—Pedes 4ti subcheliformes. Pedes 1mi inæqui, sinister major. Annulum ophthalmicum rostriferum. Appendicibus pone pedum posteriorum bases carens.

G. 3. BERNHARDUS (*D.*)—Pedes 4ti subcheliformes. Pedes 1mi interdum subæquales, sæpius dexter major. Annulum ophthalmicum non rostriferum. Appendicibus articulatis pone pedum posteriorum bases carens.

2. *Digiti instar cochlearis excavati. Flagellum antennarum internarum nudum vel nudiusculum.*

G. 4. PAGURUS.—Manus anticæ sæpius compressæ, interdum subæquæ, sæpius sinistrâ majore; digitis apice corneis, in plano verticali claudentibus. Frons medio non rostratus sed truncatus.

G. 5. CALCINUS, *D.*—Manus anticæ compressæ, inæquæ, sinistrâ majore, digitis apice calcareis, in plano verticali claudentibus. Frons medio breviter rostratus.

G. 6. ANICULUS, *D.*—Manus anticæ subæquæ, digitis apice corneis, in plano verticali claudentibus. Frons medio breviter rostratus.

G. 7. CLIBANARIUS, *D.*—Manus anticæ plus minusve depressæ, subæquæ, digitis apice corneis, in plano horizontali claudentibus. Frons medio breviter rostratus.

## 2. CANCELLINÆ.—Abdomen symmetricum.

G. CANCELLUS, *Edwards.*

## FAM. II. CENOBITIDÆ.

Antennæ internæ multo elongatæ, articulo 1mo oculis sæpius longiore, valde deflexo. Maxillipedis externi palpus flagello non instructus.—Species subterrestres.

G. 1. CENOBITA, *Edwards.*—Corpus angustum, carapace elongato, fronte non rostrato. Abdomen in cochleam retortum, superficie plerumque carnosum.

G. 2. BIRGUS, *Leach.*—Corpus latum, carapace parce oblongo postice latissimo, fronte triangulato. Abdomen rectum, laminis crustaceis dorso plerumque tectum.



## FAMILY I. PAGURIDÆ.

## SUBFAMILY I. PAGURINÆ.

## GENUS PAGURISTES, Dana.

*Pedes 4ti vergiformes, tarso terminali. Abdomen ad basin duabus vel quatuor appendicibus infra instructum. Antennarum externarum flagellum plus minusve crinitum, sæpe elongatè ciliatum. Antennæ internæ longiores, articuli apice secundi extremitatem oculorum fere attingente.*

Feet of fourth pair not prehensile, tarsus being terminal. Abdomen having below at base two or four appendages. Flagellum of outer antennæ more or less crinite, often long ciliate. Inner antennæ longer than in other Paguridæ, the apex of second joint reaching to extremity of eyes.

In the following species of this genus the hands are equal or nearly so, and the inferior margin in each is very much more arcuate than the superior. The tips of the fingers are either calcareous or corneous; usually a terminal spine or point is of the latter character.

## PAGURISTES LONGIROSTRIS.

*Rostrum angustè elongatum, acutum, integrum. Carapacis regio antica subcordata, fere nuda. Oculi graciles, margine carapacis antico longiores, basi vel aciculo antennarum externarum vel basi antennarum internarum multo longiores; squamâ basali mediocri, acutâ. Flagellum antennarum externarum nudiusculum. Pedes antici æqui manu carpoque depressis, latis, bene areolatis non scabriculis, manu infra partim villosâ. Pedes 4 sequentes intus areolati, supra hirsuti, extus fere læves et nudi.*

Beak long and narrow, acute, entire. Anterior region of carapax subcordate, nearly naked. Eyes slender, longer than anterior margin

of carapax, and very much longer than base or acicle of outer antennæ, or base of inner antennæ; basal scale of moderate size, acute. Flagellum of outer antennæ naked. Anterior feet equal, hand and carpus depressed, broad, neatly areolate, but not at all scabrous to the touch, hand below near outer margin villous. Four following feet areolate within, hirsute above, nearly smooth and naked on outer surface.

Plate 28, fig. 1 *a*, animal, enlarged two diameters; *b*, part of flagellum of outer antennæ.

East Indies.

Length, one and one-fourth inches. The carapax has on the front a projection just exterior to the eyes, which is simply acute on one side, and bears two minute points on the other; the anterior margin between forms a raised border. The basal scale of the eyes is broad at base, but abruptly narrows and terminates in a narrow triangular point, which has two or three spinules near apex. The acicle of the outer antennæ has spinulous margins. The hands are covered with small areolæ elongated transversely, which have the anterior margin ciliated; but the areolæ are so even in surface that there is no scabrous feel to the touch. The immoveable finger has a very neatly denticulate margin, while the moveable one has the margin corneous. The hairs of the back margin of the tarsi are longer than those of the lower margin. The inner surface of the penult joint of these legs has ciliated areolæ like the hands. The fourth pair of legs is not subcheliform, but unguiculate.

#### PAGURISTES HIRTUS.

*Rostrum brevissimum. Carapax plerumque hirtus. Oculi graciles, margine carapacis antico non breviores, basi vel aciculo antennarum externarum multo longiores, basi antennarum internarum breviores, squamâ basali valde elongatâ, angustâ, margine externo arcuato et tenuiter bene denticulato. Flagellum antennarum externarum infra elongatè ciliatum. Pedes 2di 3ti que hirti, crassiusculi. Pedes antichi æqui, manu breviter spinosâ et fasciculis hirsutâ, subellipticâ, margine superiore fere recto, inferiore spinis conicis armato.*



Rostrum very short. Carapax mostly rough hairy. Eyes slender, not shorter than anterior margin of carapax, much longer than base or acicle of outer antennæ, but shorter than base of inner; basal scale much elongated and narrow, the outer margin arcuate and edged with minute, slender teeth. Flagellum of outer antennæ long ciliate below. Feet of second and third pairs rough hairy in tufts, rather stout. Anterior feet equal, hand short spinous and tufted hirsute, subelliptical in outline, superior margin nearly straight, inferior much arcuate and set with conical spines.

Plate 28, fig. 2 *a*, animal, enlarged two diameters; *b*, part of inner antennæ; *c*, hand; *d*, part of leg of second or third pair; *e*, *ibid.*, of fourth pair; *f*, *ibid.*, of fifth pair.

Chili.

Length, two inches. The basal scale of the eyes is very peculiar in its very elongate narrow form, and denticulate outer margin. The male abdomen has four appendages on the left side, the first obsolescent, the rest with a small basal joint and a long narrow ciliate termination. The ciliation of the outer antennæ is long.

The species resemble the *Bernhardus æquimanus*, as observed under that species.

#### GENUS DIOGENES, Dana.

*Annulum ophthalmicum rostriferum. Pedes 4ti subcheliformes. Manus sinistra major; digiti acuminati, apicibus calcarei.*

Ophthalmic ring bearing a rostrum. Fourth pair of feet subcheliform. Left hand the larger; fingers acuminate, calcareous at tips.

The pointed fingers with calcareous tips ally the species to those of *Bernhardus*; but the left hand is much the larger, and the rostriform appendage to the ophthalmic ring is peculiar. The acicle of the outer antennæ is broad, and often deeply furcate, the two processes extending either side of the next joint.

DIOGENES MILES (*Fabr.*), *Dana*.

Plate 27, fig. 9 *a*, part of hand, much enlarged; *b*, tarsus of second or third pair of legs.

Sooloo Sea; also, New South Wales.

Length, two inches. The rostriform piece between the eyes is slender, a little concave above in its posterior half, with the edges denticulate, the teeth larger and spiniform about the apex. The base of the inner antennæ projects the length of its last joint beyond the eyes. Front margin sinuous and denticulate. Basal scale of the eyes truncate above and denticulate. Carpus and hand with moveable finger spinous along upper margin in two or three rows. Flagellum of outer antennæ thin and lax pubescent, not fringed below. Tarsus of second and third pairs of legs very short spinulous on upper margin.

*Cancer miles*, FABRICIUS, Ent. Syst., 2, p. 470.

*Cancer Diogenes*, HERBST, ii. 17, pl. 22, f. 5.

*Pagurus miles*, FABRICIUS, Supp., 412; EDWARDS, Crust., ii. 235, and Ann. des Sci. Nat., vi. 1836, 284, pl. 14, f. 2.

DIOGENES CUSTOS (*Fabr.*), *Dana*.

Plate 27, fig. 10 *a*, part of animal, enlarged two diameters; *b*, ophthalmic rostrum and basal scale; *c*, part of outer antennæ; *d*, left hand; *e*, right hand; *f*, part of third pair; *g*, extremity of fourth pair.

New South Wales.

The specimens here described as the *custos*, have the following characters in addition to those mentioned by Milne Edwards. Posterior region of the carapax pilose; anterior region with a few hairs in tufts and surface a little uneven. Ophthalmic rostriform appendage sparingly dentate, and not as narrow as in the *miles*. Outer



antennæ having the flagellum fringed below; the acicle hardly prolonged into a process on inner side, and its outer process not reaching beyond the apex of the joint following it.

*Pagurus custos*, FABRICIUS, Supp., 412; EDWARDS, Crust., ii. 236, and Ann. des Sci. Nat., vi. 1836, 284.

GENUS BERNHARDUS, Dana.

*Pedes lmi interdum subæquales, sæpius dexter major; digiti acuminati, apice calcarei. Annulum ophthalmicum non rostriferum. Appendicibus articulatis pone pedes thoracis posticos carens.*

Anterior feet sometimes subequal, usually the right larger; fingers acuminate, with calcareous tips. Ophthalmic ring not rostriferous. No articulate appendages just posterior to fifth thoracic feet.

In the genus Bernhardus, the hands are much flattened or depressed in form, and so also, in general, the carpus; and the latter joint is sometimes as long as the hand and similar in form, but reversed. Not only is the right leg of the anterior pair larger than the left; but the same relation holds for the following two pairs. In a few species, however, the legs of the anterior pair are nearly equal, and the left may even be a little the larger. The acicle of the outer antennæ is long subulate, seldom shorter than the eye-peduncle. The tips of the fingers of the larger hand are calcareous.

1. *Manus major quoad margines symmetrica vel æque arcuata.*

BERNHARDUS NOVI-ZEALANDIÆ.

*Oculorum pedunculi margine carapacis antico vix breviores, basi antennarum externarum parce longiores, aciculo hirsuto multo longiores; cornea non obliqua, perbrevis; squama basalis paulo angusta, apice inciso-denticulata. Pedes antici valde inæqui, fere nudi, carpo versus apicem paulo pubescente, granuli-spinuloso, manu grandi, oblongâ, parce longiore non latiore quam carpus, superficie 6 lineis tuberculatis (marginibus inclusis) ornatâ hasque inter lineas fere lævi; digito mo-*

*bili carinato, crenulato et superficie uni-seriatim tuberculato etiam tuberculis minoribus instructo. Pedes 3 sequentes marginibus ambobus densè hirsuti, vix spinulosi.*

Peduncles of eyes hardly shorter than anterior margin of carapax, slightly longer than base of outer antennæ, much longer than acicle, which is hirsute on inner side; cornea not oblique, short; basal scale rather narrow, inciso-denticulate at apex. Anterior feet very unequal, nearly naked; carpus towards apex somewhat pubescent, surface granuli-spinulous; larger hand oblong, sparingly longer but not broader than carpus, having on the surface six lines of small rounded tubercles, the marginal being included, and smooth between, the moveable finger carinate and crenulate, outer surface with one series of tubercles and other smaller tubercles. Four following pairs of feet with the margins densely hirsute, hardly spinulous.

Plate 27, fig. 1 *a*, animal, natural size; *b*, part of flagellum of outer antennæ, much enlarged; *c*, extremity of leg of fourth pair, enlarged.

New Zealand.

Length, one and a half to two inches; ratio of carpus to hand, in length, nearly as 10:11, and breadth of hand, two-thirds its length. Colour, dark green to grayish green; rows of granules on hand deep blue; deep blue colour also at base of joints of six anterior legs; peduncle of eye green, except near cornea where it is white; eye brownish green; inner antennæ green with blue tips. The fingers of the smaller hand have a corneous edge, but not those of the larger. The tarsi are rather short, without spines above. The anterior part of the carapax is rather longer than broad, or not shorter; and it is nearly naked. The peduncle of the eyes is cylindrical, and has the tip triangular in outline. The hand of the fourth pair of legs is smooth excepting lower edge, and the moveable finger is broad lamellar. This species dies soon after being taken out of the water.

The *P. cristatus* (a New Zealand species, Edwards, Crust., ii. 218) has the acicle of the outer antennæ longer than the eyes, while it is much shorter in the above species.



## BERNHARDUS ARMATUS.

*Carapax subnudus.* Oculorum pedunculi margine carapacis antico breviores sive basi sive aciculo subulato subnudo antennarum externarum multo breviores; cornea obliqua, dimidii pedunculi longitudine; squama basalis subovata, apiculata. Frons marginatus, medio paulo saliens, obtusus. Pedes toti fere nudi (manu junioris pubescentiore), antici valde inæqui, usque ad digitorum extremitatem dense tenuiter spinosa spinis partim subseriatis, manu grandi latâ, oblongâ, multo longiore et parce latiore quam carpus; 4 sequentes supra spinulosi, tarsi infra paulo lateraliter uniseriatim spinulosi.

Carapax nearly naked. Peduncles of eyes shorter than front; also much shorter than base of outer antennæ, or than the acicle, which is slender, subulate, and nearly naked; cornea oblique, half as long as peduncle; basal scale subovate, apiculate. Front marginate, the middle slightly salient, obtuse. Feet all very nearly naked (hand of younger individuals more pubescent); anterior pair very unequal, densely spinous even to tips of fingers, spines slender and subseriate, large hand broad and oblong, much longer and slightly broader than carpus, four following spinulous above, tarsi with a series of spinules below but inside of lower margin.

Plate 27, fig. 2 *a*, animal, natural size; *b*, extremity of fourth pair, enlarged.

## Puget's Sound.

Length, one and three-fourths inches; length of hand, seven and a half lines; breadth, four lines; length of carpus, four and a half lines. On the legs there are a few hairs among the spines, but none longer than the spines themselves, and without a glass, they appear quite naked. The fingers of the smaller hand have a corneous edge, and there are traces of the same on those of the larger hand. The tarsi are long, and slender, and naked like the rest of the legs. The anterior part of the carapax is hardly as long as broad. The peduncle of the eyes has the projection at tip narrow; the scale at base has a

white calcareous margin, differing from the middle portions, which have a fleshy look; there is also a white calcareous border along the front margin of the carapax. The posterior part of the carapax is hardly less calcareous than the anterior, and both are very flexible. The outer antennæ are nearly as long as the body; the acicle almost naked.

## BERNHARDUS HIRSUTIUSCULUS.

*Frons breviter rostratus, subacutus. Carapax brevis, sparsim pubescens, regione anticâ transversâ. Oculorum pedunculi perbreves, basi antennarum externarum multo breviores, aciculo subnudo parce breviores; cornua vix obliqua; squama basalis ovata, non acuta. Pedes antici valde inæqui, angusti, carpo manūque pubescentes et granuli-scabri, margine superiore non spinulosi nec denticulati, crassi; manu oblongâ (duplo longiore quam latiore) paulo breviorē parce latiore quam carpus, marginibus symmetricis. Pedes 4 sequentes hirsutiusculi, non spinulosi, tarsi paulo compressis, infra subtiliter spinulosi.*

Front short rostrate and subacute. Carapax short, sparsely hairy in tufts, anterior region transverse. Peduncles of eyes very short, much shorter than base of outer antennæ, and slightly shorter than the acicle, which is nearly naked; cornea scarcely oblique; basal scale ovate, not acute. Anterior feet very unequal, narrow, carpus and hand pubescent and granuli-scabrous, on upper margin not spinulous nor denticulate, stout and rounded; hand oblong (twice as long as broad), somewhat shorter and slightly wider than carpus, the margins symmetrical. Four following feet short hirsute, not spinulous, tarsi a little compressed, below minutely spinulous.

Plate 27, fig. 3 *a*, animal, enlarged two diameters; *b*, part of flagellum of outer antennæ, much more enlarged.

Dungeness, Puget's Sound.

Length, one and one-fourth inches; length of hand, four lines; breadth, two lines; length of carpus, two and three-fourths lines. Fingers of smaller hand having a corneous edge, but not those of the



larger. Tarsi of third pair long. On the surface of the moveable finger there is a row of minute tubercles.

BERNHARDUS PUBESCENS.

*B. hirsutiusculo affinis.* *Frons medio subacutus. Carapax longior, fere nudus, regione anticâ non transversâ. Oculorum pedunculi longi, margine carapacis antico non breviores, basi antennarum externarum parce longiores, aciculo multo longiores; cornea non obliqua; squama basalis subovata, apice rotundata. Flagellum antennarum externarum nudiusculum. Pedes antici valde inæqui, angusti, carpo manuque pubescentes, scabriculi, non sparsim granulosi, carpo ad marginem superiorem subtilissimè spinuloso, manu oblongâ (duplo longiore quam latiore) vix breviorè vel latiore quam carpus, marginibus symmetricis. Pedes 4 sequentes pubescentes, non spinulosi.*

Near *B. hirsutiusculus*. Front subacute at middle. Carapax longer, naked, anterior region not transverse. Peduncles of eyes long, not shorter than anterior margin of carapax, slightly longer than the base of the outer antennæ, and much longer than the acicle; cornea not oblique; basal scale subovate, rounded at apex. Flagellum of outer antennæ nearly naked. Anterior feet very unequal, narrow, carpus and hand pubescent, minute scabrous, and not scattered granulous, carpus minute spinulous near upper margin, hand oblong (twice longer than broad), hardly shorter or wider than carpus, the margins symmetrical. Four following feet pubescent, not spinulous.

Plate 27, fig. 4 *a*, part of animal, enlarged four diameters; *b*, *c*, right and left hands.

Loc. —?—Collected by officers of the ship Relief? The shells in which the species occur, are found, according to Dr. A. A. Gould, on the coast of the United States, one species as far north as Massachusetts, and also in the West Indies; another not farther north than Carolina. The species may be from Florida, but if collected by the ship Relief (Exp. Exp.), it is probably from Brazil.

Length, one inch. Near each margin of the hand there is a row of acute granules; the hairs are fine and rather long. The tarsi are

flattened and rather long and slender, surface not channeled. Hairs of flagellum of outer antennæ few, not longer than breadth of joints.

## BERNHARDUS OBESOCARPUS.

*Frons medio prominulus, obtusus. Regio carapacis antica paulo transversa, nudiuscula. Oculi crassi et perbreves, aciculo longiores, squamâ basali ovatâ, subacutâ, integrâ. Antennæ externæ nudæ, basi multo longiore quam oculus, aciculo crasso, brevi, apicem articuli 3tiii attingente. Pedes toti fere nudi et granulosi, non armati; antici inæqui, manu majore oblongâ, convexâ, symmetricâ, granulis nitidis, partim seriatis, carpo multo crassiore quam manus et tertiâ parte brevior, parce latiore; pares 2di 3tiii que crassiusculi, articulo 3tio supra scabro-rugato et breviter hirsuto, tarso curvato, canaliculato.*

Front slightly prominent at middle, obtuse. Anterior region of carapax transverse, nearly nude. Eyes very short and stout, longer than acicle, basal scale ovate, subacute, entire. Outer antennæ nude, base much longer than eye, acicle stout, short, reaching to apex of third joint of base. Feet all nearly nude and granulous, not armed with spines; anterior pair unequal; larger hand oblong, convex, symmetrical, granules neat and shining, partly in series, carpus oblong, much thicker than hand, and a third shorter; second and third pairs of legs moderately stout, third joint rugate or scabrous above and short hirsute, tarsus curved, channeled.

Plate 27, fig. 5 *a*, part of animal, enlarged two diameters; *b*, right hand, *ibid.*; *c*, left, *ibid.*; *d*, right leg of third pair, *ibid.*

Valparaiso ?

Length of body, three inches.

## BERNHARDUS ÆQUIMANUS.

*Carapax sparsim pilosus, regione anticâ non oblongâ, fronte ad medium angulato et vix rostrato. Oculi cylindrici, aciculum antennalem longi-*



*tudine æquantes, squamâ basali apice productâ et 3-4-denticulatâ. Antennarum externarum flagellum infra longe ciliatum. Pedes superficie granulati, partim sparsim hirsuti, marginibus hirti; antici æqui, mediocres, manu breviter ellipticâ, parce latiore et longiore quam carpus, non costatâ, marginibus subspinulosis, carpo supra subspinuloso et hirto. Pedum 4 sequentium tarsus bene canaliculatus, infra ciliatus.*

Carapax sparsely hairy in tufts, anterior region not oblong, front having a low angle at middle, hardly rostrate. Eyes cylindrical, as long as acicle, basal scale prolonged on inner side, and 3-4-denticulate at apex. Flagellum of outer antennæ below long ciliate. Feet having surface granulate, in part sparsely hirsute and margins longer hirsute; anterior pair equal, of moderate size, hand short, elliptic, a little broader and longer than carpus, not costate, margins subspinous, carpus also subspinous above and hairy. Tarsus of second and third pairs of legs long, canaliculate, below ciliate.

Plate 27, fig. 6, animal, enlarged three diameters.

Valparaiso?

Body one and a half inches long. Eyes hardly as long as anterior margin of carapax. The long fringe of the outer antennæ allies the species to the Paguristes. Fourth joint of second and third pairs of legs small tuberculate along dorsal side and hirsute; fifth joint between small tuberculate or granulous and corrugate, with traces of a longitudinal channel above. Tarsus much longer than fifth joint, channels deep, with a series of hairs on inner half of inner channel, and outer half of lower channel, the hairs being continued on in each of these channels, but shorter. Second basal joint of outer antennæ broad and flat above, and having inner margin denticulate. A few minute tufts of hairs on peduncles of eyes, especially towards outer side. Granules (or minute tubercles) of hands hardly in series, excepting a single series near middle of surface. Peduncle of eyes extending on inner side nearly to tip.

This species resembles *Paguristes hirtus* in its equal hands, fringed outer antennæ, and several other characters. But it differs in the points of generic peculiarity, and besides, is different in the basal joints and acicle of the outer antennæ, in the tarsi, &c.

BERNHARDUS EDWARDSII (*Edw.*), *Dana.*

Callao, Peru; Chili.

This neat species has very unequal hands; the right broad and short, oval (opposite sides parallel), thin with thin edges (the edges slightly carinated), and a smooth even surface, excepting a neat miliary granulation; the fingers are broad, and the extremity of the hand, the fingers being closed, is very regularly rounded. The carpus is narrower than the hand, and about three-fourths as long. Anterior region of the carapax subovate, slightly oblong, pointed at middle in front. Legs of second and third pairs very nearly naked. Colour of the legs in a dead specimen flesh-red. Length of body, about one inch.

*Pagurus perlatus*, EDWARDS, Ann. des Sci. Nat., 1848 [3], v. 60. We change the name *perlatus*, as the word in Latin signifies very broad, and not pearly.

2. *Manus majoris margines inter se dissimiles, non æque curvati.*

## BERNHARDUS TENUIMANUS.

*Frons medio subacutus. Carapax nudus. Oculorum pedunculi breves, basi antennarum externarum paulo breviores, aciculo subulato subnudo vix breviores; cornea non obliqua, brevis; squama basalis angusta, acuta. Pedes toti nudi, antici valde inæqui, granulati granulis vix seriatis, carpo margine superiore denticulato, manu majore tenuissime compressâ, parce oblongâ, multo latiore quam carpus, margine superiore tenuiter cristato et denticulato, inferiore tenui, manu minore carpoque suo angustissimè oblongis. Pedes 4 sequentes lateraliter læves, margine superno subspinulosi.*

Front at middle subacute. Carapax naked. Peduncles of eyes short, a little shorter than base of outer antennæ, but hardly shorter than the acicle, which is subulate and nearly naked; cornea not oblique, short; basal scale narrow oblong, acute. All the feet naked, the anterior very unequal granulate, granules hardly seriate, and quite



small, carpus denticulate (or subspinulous) at superior margin; large hand very thin, sparingly oblong, much broader than carpus; superior margin thin cristate and denticulate, inferior thin; small hand and carpus very narrow oblong. Four following pairs of feet with the sides smooth, and upper margin subspinulous.

Plate 27, fig. 7 *a*, right hand and carpus, enlarged two diameters; *b*, left, *ibid.*; *c*, third pair, *ibid.*

#### Puget's Sound.

Length, one to one and one-fourth inches; length of larger hand, four lines; breadth, three lines; breadth and length of carpus, each two and a half lines; smaller hand, two and a half lines long, and one line broad. Remarkable for the thin hand, the two margins not symmetrical, upper margin cristate, surface with fine scattered granules, no hairs on carapax. The fingers of the smaller hand have a corneous edge, but not those of the larger. Flagella of outer antennæ as usual, naked. Tarsi long, somewhat compressed but narrow, some minute spines above and below; lateral surface of legs shining. Hand of fourth pair smooth, except lower edge.

The specimens preserved in alcohol, have a brownish red colour; the four posterior legs spotted with red.

#### BERNHARDUS CRINITICORNIS.

*Frons medio parce angulatus. Regio carapacis antica non transversa. Oculi mediocres, aciculo antennali paulo longiores, squamâ basali apicem rotundatâ. Flagellum antennarum externarum infra crinitum, non ciliatum. Pedes antici valde inæqui, nudiusculi; manu majore oblongâ paulo longiore et latiore quam carpus, scabriculâ, spinulis subtilissimis 4-5-seriatis, margine inferiore fere recto, carpo minutè spinuloso. Pedes 2di 3tiique laxè pubescentes, non spinulosi, tarso non canaliculato.*

Front having a slightly prominent angle at middle. Anterior region of carapax not transverse. Eyes of moderate length, a little longer than acicle, basal scale rounded at apex. Flagellum of outer an-

tennæ rather long pilose below. Anterior feet very unequal, nearly naked; larger hand oblong, a little longer and broader than carpus, finely scabrous, the very minute spinules in four or five series, lower margin of hand nearly straight; carpus minutely spinulous. Feet of second and third pairs lax pubescent, not spinulous, tarsus not channeled.

Plate 27, fig. 8 *a*, part of animal, enlarged four diameters; *b*, basal scale of eyes; *c*, right hand, enlarged four diameters; *d*, left, *ibid.*; *e*, third pair, left, *ibid.*

Rio Janeiro; the specimens inhabit the *Nassa vibex* (Say), or a closely related species.

Length of body, nine to ten lines. Pubescence of second and third pairs of legs rather long, but very fine and sparse, and not at all concealing the surface of the legs, mostly confined to upper surface. The hairs of the flagellum of the outer antennæ are very fine, and as long as six or eight of the joints together. Base of outer antennæ not longer than eyes, cornea with posterior margin above nearly straight. Smaller hand and carpus linear, having some pubescence, carpus with two rows of spinules.

#### GENUS PAGURUS (*Fabr.*), *Dana.*

*Pedes antici raro subæqui, sinistro sæpius majore. Digni in plano verticali claudentes, apice cornei, instar cochlearis excavati. Frons non rostratus.*

Anterior feet rarely subequal, the left usually the larger; fingers moving in a vertical plane, corneous at tips, spoon-excavate. Front not rostrate.

#### PAGURUS DIFFORMIS.

Feejee Islands; also Straits of Balabac.

Larger specimen, two and a half inches long; larger hand, thirteen lines long and eight and a half wide. The penult joint of the third



pair of legs, left side, has the summit obliquely truncate, the surface being linear, very slightly concave and at right angles nearly with the sides; the outer edge is most raised and subcarinate. The tarsus corresponding is carinate above and very nearly flat on outer surface. The ocular peduncle (including cornea), hardly longer than the base of the outer antennæ, is very much shorter than the base of the inner antennæ.

*P. deformis*, EDWARDS, Ann. des Sci. Nat. [2], vi. 272, pl. 13 f. 4; Crust., ii. 222.

PAGURUS ASPER (*De Haan*).

Sandwich Islands.

Length, two inches. The eyes and general characters of this species are as in the *difformis*. The front margin is a little rounded across the middle, and projects into a large tooth between either eye and the outer antennæ adjoining. It differs from the *difformis* in having the penult joint of the left leg of the third pair convex on the outer side, with the inner of the upper edges most prominent, and the outer obtuse; the tarsus is subcarinate, and has a raised ridge along the outer side. The base of the outer antennæ reaches a little beyond the eyes; the inner antennæ are much longer than the eyes. The second and third pairs of legs are very nearly naked, excepting the tarsus, which on the inner surface bears tufts of short hairs. They have some small tubercles along the upper side of some of the joints, but not more than in the *difformis*. The larger hand in our specimen is wanting. The smaller is quite small and tufted hairy. The surface is somewhat uneven, being a little raised at the base of the tufts of hairs, but it is not spinous. The specimen (a female) has three appendages on one side of the abdomen and none on the other; each is rather large, and consists of an oblong basal joint bearing three curved linear ciliated lamellæ; a fourth on the same side is very small. There are also two oblong, fleshy, ciliated lobes, a short distance inside (that is, nearer the ventral line) of the second and third of these appendages.

*P. asper*, DE HAAN, Faun. Japon., 208, pl. 49, f. 4.

PAGURUS GUTTATUS (*Olivier*).

Plate 28, fig. 3 *a*, animal, natural size; *b*, leg of fourth pair.

Upolu, Navigator Islands, from the coral reef.

The legs are rounded in all their joints, and the tarsus of the second and third pairs is much longer than the preceding joint, terete and curved. The basal part of the peduncles of the eyes projects nearly their diameter beyond the front. Colour of the carapax anteriorly, greenish blue; posteriorly, blue over the central area; yellowish along the middle, and laterally, first nearly vermilion, and gradually changing to clear brownish red spotted with white. Legs deep maroon, spotted with white, excepting fourth joint, which is blue above. Base of peduncles of eyes and base of outer antennæ, same colour as legs; rest of peduncles, a purplish umber; first antennæ, dull greenish; flagellum of second antennæ and last joint of base, dull green. Abdomen, deep brownish red spotted with white.

Carapax broad obcordate, transversely divided by a narrow furrow; anterior portion marked with a large lyriform area. Anterior portion of lateral margin with a few tufts of bristly hairs, and similar hairs but shorter on the base of the ocular peduncles and outer antennæ. Peduncles of eyes subcylindrical, a little larger at extremity. Legs smooth, a little spinous at apex of joints, covered with hairs of same colour as leg, in tufts and scattered; on left leg of third pair much more densely hairy than on right leg of same pair, and hairs mostly on superior and inferior margins.

Flagellum of second antennæ longer than carapax.

PAGURUS PUNCTULATUS, *Olivier*.

Plate 28, fig. 4 *a*, carapax, natural size; *b*, side view of same.

China Seas.

The left hand is short and large, with the outer surface regularly



convex. The part of the hand preceding the fingers hardly longer than broad. In a specimen, the carapax of which is one and three-fourths inches long, this hand has for its breadth, thirteen lines; length, eighteen lines; length at middle to base of moveable finger, one inch or twelve lines. The carpus has three sharp and stout spines above; the arm several long and slender teeth on inferior margin. The eyes are stouter and proportionally shorter than in the *spinimanus*; they are enlarged and globular at the extremity. The structure of the carapax is described in the course of our general remarks on the Inferior Anomoura, page 430.

PAGURUS SPINIMANUS? *Edw.*

Plate 28, fig. 5 *a*, animal, natural size; *b*, front, enlarged; *c*, hand, side view, enlarged.

Honden or Dog Island, Paumotu Archipelago; Tongatabu, Friendly Islands; Sooloo Sea.

The specimens referred to the *spinimanus* of Edwards, resemble the *punctulatus*; but the hands are less unequal; the larger hand is not so massive, being proportionally more oblong and less inflated; and the spines have but few hairs arising from the base of each; the eyes are longer and more slender, being fully as long as the width of the carapax in front; the tarsi are all similarly subterete; the arm is twice as long as wide, instead of being as wide as it is long.

The colour of the body, including abdomen, carapax, and legs, is a bright cherry-red or brownish red, with white spots, set in a blackish or reddish black ring, and the hairs are reddish. The eye-peduncles have a reddish slate colour, bordering on purple; the inner antennæ, orange; outer, orange at base, with the flagellum colourless. The flagellum of the outer antennæ is naked, and consists of even symmetrical joints throughout. Minute spines may be distinguished on the penult joint of the second and third pairs of legs among the hairs.

*Pagurus spinimanus*, EDWARDS, Ann. des Sci. Nat. [3], v. 61, 1848.

PAGURUS EUOPSIS.

*P. punctulato affinis.* *Oculi fronte carapacis valde longiores, crassius-*

*culi. Flagellum antennarum externarum nudum, articulis versus antennæ extremitatem latere interno gibbosis; aciculum parvulum. Pedes antici sat inæqui, manu majore carpoque oblongis, extus spinulosis et hirsutis. Pedes 2di 3tiique marginibus multo hirsuti, articulo 5to spinulis supra paulo armato, tarsis totis subteretibus, undique divaricatè hirsutis.*

Near *P. punctulatus*. Eyes much longer than front of carapax, stoutish. Flagellum of outer antennæ nude, the joints of apical half gibbous on inner side at apex; acicle quite small and slender. Anterior feet moderately unequal, the larger hand oblong, hand and carpus spinulous and hirsute on outer surface. Feet of second and third pairs having hairy margins, fifth joint minute spinulous on upper side, tarsi all subterete, and on all sides divaricately hirsute.

Plate 28, fig. 6 *a*, animal, natural size; *b*, joints of flagellum, from basal half; *c*, *ibid.*, from apical half.

Upolu, Navigator Group; also, Balabac Passage.

Length of body, two and one-fourth inches. The specimen figured and coloured was from the Navigator Group. The carapax has a dark maroon spot, just behind the front; and the posterior region either side of the middle is of a similar colour dotted with white. The legs are pale sepia with a dark maroon (nearly black) broad band on the third and fourth joints of the second and third pairs. The eye-peduncle is pale brown, with a yellow band adjoining the cornea. Inner antennæ greenish. Hairs of legs spotted with red and white. Abdomen along its dorsal surface dark maroon, in part dotted with white.

The specimens resemble those referred to *spinimanus*, although different in colouring, in the flagella of the outer antennæ, and the much longer eyes. Both hands are convex externally without crests or a seriate arrangement of the spines. The cornea is short. Carapax almost wholly naked.

PAGURUS GRANULATUS, *Olivier.*

Rio Janeiro.



Length of body, from extremity of abdomen to front margin, eight inches; length, to extremity of hands, thirteen inches; the breadth of carapax in front, thirteen and a half lines; length of eye including peduncle, from base, fourteen and a half lines. The anterior part of the carapax is smoothish, with very few tufts of hairs. The carpus has a row of five stout spines above; the hand is without corresponding spines; the tubercles of the smaller hand in many instances have each a small centre tubercle, surrounded anteriorly by a radiating series of oblong tubercles. The tarsus of the second and third pairs of legs has three dense rows of hairs or tufts of hairs, which are most distinct or more dense along the apical half of the joint. The peduncle of the eye on the upper side, extends quite to the apex of the eye, and bears near its apex a few short hairs.

OLIVIER, *Encyc.*, viii. 640; EDWARDS, *Crust.*, ii. 225.

#### PAGURUS FABIMANUS.

*Frons medio fere rectus. Carapax plerumque nudus, regione anticâ parce transversâ. Oculi longiusculi, basi antennarum omnium longiores; squama basalis lata, inverso-triangulata. Pedes antici valde inæqui; manu majore oblongâ, marginibus fere parallelis et subacutis, superiore spinuloso, inferiore crenulato aut subintegro, superficie externâ bene convexâ, tomentosâ, scabriculâ, digito mobili superne fere ad apicem minute spinuloso. Pedes 4 sequentes leviter hirsuti, tarsis prælongis, tarso pedis sinistri tertii subtriquetro, superficie hujus articuli et precedentis externâ planâ aut subconcovâ, tomentosâ, margine superiore non spinuloso.*

Front nearly straight at middle. Carapax mostly naked, anterior part sparingly transverse. Eyes rather long, longer than base of either pair of antennæ; basal scale large and broad, inverted triangular. Anterior feet very unequal; larger hand oblong, the margins nearly parallel and subacute, upper margin spinulous, lower crenulate or subentire; outer surface evenly convex, tomentose, scabrous, moveable finger with the upper edge spinulous nearly to apex. Four following feet thin hirsute, tarsi very long, on the left foot of third pair, nearly three-sided, the outer surface of this and preceding joints flat or somewhat concave and tomentose, upper margin not spinulous.

Plate 28, fig. 7 *a*, animal, natural size; *a'*, part of animal, enlarged two diameters; *b*, left hand, natural size; *c*, right, *ibid.*; *d*, extremity of left leg, third pair, *ibid.*; *e*, extremity of fourth pair, enlarged.

From Caldera, Mindanao, Philippines; also, Feejee Archipelago and Tongatabu.

Length, one and one-half inches. Larger hand, six lines long, and three and two-thirds lines broad; moveable finger, two and a half lines long; whole length of eye from base, three and three-fourths lines. The basal scale is broadest above, and its apical margin but little oblique, with a few denticulations at the inner apex. The tarsus of the left leg of third pair is very narrow subfalciform, being curved and narrow from its base where it is broadest; preceding joint considerably broader than tarsus, hardly twice as long as broad. On the left side the male abdomen has three small appendages, and none on the right.

The larger hand has nearly the shape of half a bean, and to this the specific name alludes.

A Tongatabu specimen is represented in the coloured figure. We refer it here with some little doubt, as we have not the specimen for comparison with the Philippine Island individuals. The coloured drawing was made from the living animal. The peduncles of the eyes are light slate-coloured, with yellow adjoining the cornea, eyes light blue; carapax mostly pale grayish green, near front brownish red, or brown more or less dotted with white, which same colour characterizes the upper portion of some of the joints of the legs; outer antennæ, yellow; inner, bluish, excepting orange tips. Abdomen grayish green and spotted or clouded.

#### PAGURUS SCABRIMANUS.

*P. fabimano formâ carapacis manus et squamæ oculi basalis similis. Oculi parce breviores, basi antennarum externarum longiores, internarum non longiores. Manus major extus non tomentosa, nudiuscula, scabricula, supra spinulosa, infra denticulata aut crenulata, digito mobili supra vix spinuloso, carpo supra et extus prope apicem spinuloso.*



*Pedes 4 sequentes leviter hirsuti, tarsis prælongis, tarso pedis sinistri tertii non subtriquestro, superficie externâ nec planâ, nec tomentosâ, margine superiore minute spinuloso.*

Very near the *fabimanus* in form of carapax, hands, and basal scale to eye. Eyes slightly shorter, longer than base of outer antennæ, but hardly longer than inner. Larger hand not tomentose externally, nearly naked, granuli-scabrous, spinulous on upper margin, denticulate or crenulate on lower, moveable finger hardly spinulous above, carpus spinulous above and also on outer surface near apex. Feet of two following pairs hirsute, tarsi very long, tarsus of left foot of third pair not subtriangular, outer surface not flat, and not tomentose, upper margin minute spinulous.

Plate 28, fig. 8 *a*, part of animal, enlarged two diameters; *b*, left hand, natural size; *c*, left leg, third pair, *ibid*.

Caldera, Mindanao.

Length, one to one and one-fourth inches. The form of the tarsus of the left leg of third pair, distinguishes this species readily from the *fabimanus*, which it so much resembles. The outer surface of the hand is also spinulous towards the upper edge, and the carpus has two or three small spines on the outer surface near the apical margin.

#### GENUS CALCINUS, Dana.

*Pedes antici inæqui, sinistro majore. Digiti in plano verticali claudentes, apice calcarei, instar cochlearis excavati. Frons breviter rostratus.*

Anterior feet unequal, the left larger. Fingers moving in a vertical plane, calcareous at tips, spoon-excavate. Front with a small point as a rostrum.

The species are naked, or but little hairy. They have been found only in the tropics.

CALCINUS GAIMARDII (*Edwards*), *Dana*.

Plate 28, fig. 9, animal, natural size.

Feejee Islands, Pacific Ocean; Balabac Passage, north of Borneo, and Sooloo Sea.

Length, one and one-fourth inches. Colour of anterior part of carapax and legs, all deep reddish chestnut brown, except tips of fingers, which are white or yellowish white, and tarsi, which are orange, though becoming brownish at base and yellowish at apex. The peduncles of the eyes are deep yellow, except near tips, where they are bright blue; eyes, greenish black; posterior part of carapax, light grayish green; abdomen, nearly colourless, greenish at base; outer antennæ orange; inner, brownish green, with tips orange.

Peduncles of eyes long and slender, considerably longer than front margin of carapax. A small median point to front. Acicle of outer antennæ much shorter than half the eye-peduncle. Hands much unequal; the larger granulous, especially towards and on fingers; above nearly smooth, obtuse-angled, though nearly rounded; below rounded and longitudinally arcuate; smaller hand acute and dentate above; surface somewhat scabrous with a little short pubescence. Carpus of larger hand with a tooth above middle of outer surface. Second and third pairs of legs hairy, on under side of last two joints, densely so on third pair both sides. Tarsus rather short, rounded above, nearly naked. Legs all shining. Carapax naked.

*Pagurus Gaimardii*, EDWARDS, Ann. des Sci. Nat., [3], v. 63. July, 1848.

CALCINUS TIBICEN (*Herbst*), *Dana*.

Raraka, Vincennes, Carlshoff, Waterland, Paumotu Archipelago; Society and Sandwich Islands; Samoan Islands at Tutuila; Wakes Island; Straits of Balabac, north of Borneo.

Length, two to two and one-fourth inches. The hands are quite



smooth, without tubercles or hairs, the left much the larger, and black or brownish black above near articulation, while the lower part is white. The legs of the next two pairs have a clear brownish yellow colour, approaching burnt sienna, with a longitudinal line of sepia-brown. (These colours fade in alcohol, the dark part of the hand becoming pale brown or even purplish, and the following legs, an orange, with a darker longitudinal line.) The peduncles of the eyes are ochre yellow, except the basal half, which is bright blue; outer antennæ, orange; inner, bright blue, tips brownish red; carapax green to olive-green.

The carapax has a small median point in front; the anterior region is slightly oblong, and is marked like that of the *elegans*. Posterior region membranous, excepting anterior margin. Peduncles of the eyes longer than the front margin of carapax, more than twice as long as the acicle of the outer antennæ, which is quite short; scale of basal portion subtriangular, acute, the two nearly in contact on the median line. The larger hand is very large, subquadrate, and rounded above; fingers neatly spoon-excavate. The tarsus of the following four legs has a few tufts of hairs, and a single brown spot either side, which often meets on the medial line so as to become a single spot; preceding joints naked, with the exception of a few hairs at lower apex. The male abdomen has four pairs of slender ciliate appendages, proceeding from dorsal plates that are nearly or quite membranous.

*Cancer tibicen*, HERBST, ii. 25, pl. 23, f. 7.

*Pagurus tibicen*, EDWARDS, Crust., ii. 229, and Cuv., Règne An., pl. 44, f. 3.

*Pagurus levimanus*, RANDALL, Jour. Acad. Nat. Sci. Philad., viii. 135.

#### CALCINUS ELEGANS (*Edwards*), *Dana*.

Plate 28, fig. 10 *a*, animal, natural size; *b*, enlarged view; *c*, part of larger hand, enlarged.

Paumotu Archipelago, at the islands Clermont Tonnerre, Carlshoff, and Waterland; also, Hawaiian Islands; Wakes Island.

Length, one and three-fourths inches. This beautiful species is strongly marked in the preserved or dead specimen, by the bands of

bright red and white (three bands alternate) on its second and third pairs of legs, the bright red or dark spots on the tarsus, and the very small white tubercles on the fingers (and to some extent on the upper side of the hand), whose white colour contrasts strongly with the orange colour of the hands. A specimen figured by the writer, while alive, at the Paumotus, has the colours given in the figure referred to, and the same was observed at Wakes Island. The hands are bright green, excepting the minute white tubercles; the antennæ are orange; eyes, blue; second and third pairs of legs, banded with velvet black and bright blue, and punctate; hairs of the tarsus, carmine. Owen's figure gives the colours of our dead specimens. In alcohol, bright blue usually fades to white, in this and other species. The legs are almost wholly naked; on the under side of the last three joints of the second and third pairs of legs there are hairs in tufts, which are rather densely crowded on the left leg of the third pair. The hands are naked, with the exception of a minute bristle or so near the extremity of the fingers and on the inner surface. The eyes are a little longer than the front of the carapax, and the cornea has its posterior margin above straight transverse. The acicle of the outer antennæ is not half as long as the eye-peduncle. Carapax with a low median point to the front margin; anterior region slightly oblong and having the outline of its median region marked behind with a suture shaped like a broad V with convex sides. Posterior region of the carapax wholly membranous. Fingers neatly spoon-like, with the edges white.

*Pagurus elegans*, EDWARDS, Crust., ii. 229; Ann. des Sci. Nat. [2], vi. pl. 13, f. 2.

*Pagurus pictus*, OWEN, Crust. of the Blossom, p. 83, pl. 25, f. 2, 2 a, 1839.

*Pagurus decorus*, RANDALL, Jour. Acad. Nat. Sci. Philad., viii. 135, 1840.

#### CALCINUS LATENS (*Randall*), *Dana*.

Plate 28, fig. 11, animal, natural size.

Tongatabu; Feejee Archipelago; Wakes Island; Balabac Passage, north of Borneo; Sandwich Islands.

Length, one inch. Colour, when living, mostly pale green; the



penult joint of second and third pairs of legs pink or rose-coloured on basal half and the rest green; the tarsus dark brown at base, the tips yellowish white; peduncles of eyes, rose-coloured; eyes dark dull blue; outer antennæ, orange; inner antennæ, blue with orange tips.

Front with a low median point; carapax naked; posterior part wholly membranous, excepting sometimes its anterior margin. Peduncles of eyes longer than front margin of carapax, slender; scale of basal part very small, subtriangular; acicle of outer antennæ very short. Legs smooth; larger hand naked, granulous, carinate and subdenticulate below, and somewhat angled and uneven in outline above, finger subcarinate above, carpus having a small tubercle on the outer surface, as in the *Gaimardii*; smaller hand cristate, and five-dentate above, sparsely pubescent, finger subtuberculous, carpus carinate, but scarcely dentate; following legs smooth or very nearly so, no joints sulcate, a few hairs above on penult joint, some tufts below on same and on tarsus, but not so densely hairy on third pair as in *elegans*, or *Gaimardii*. The crested under side of the larger hand, distinguishes this species from the *Gaimardii*. Specimens preserved in alcohol are usually colourless except the basal portion of the tarsus which is brownish red.

This species is near the *cristimanus* of Edwards (Ann. des Sci. Nat. [3], v. 64, 1848), but in the short description given of that species, the stomach region is said to be furnished laterally with long hairs, which is not true of the *latens*. If the two species prove to be identical, Dr. Randall has the precedence in time by nearly ten years.

A specimen from the Sandwich Islands is very similar in all respects, but had the larger hand broken off; and this hand, if it be the one which is now with the specimen in the same bottle, as we believe, differs decidedly from that of the *latens* in being rounded below, and also, in being longitudinally much concave in the outline of the lower side.

*Pagurus latens*, J. W. RANDALL, Jour. Acad. Nat. Sci. Philad., viii. 135.

#### GENUS ANICULUS, Dana.

*Pedes antici subæqui. Digiti in plano verticali claudentes, apice cornei, instar cochlearis excavati. Frons breviter rostratus.*

Anterior feet subequal. Fingers moving in same vertical plane, corneous at tips, spoon-excavate. Front short rostrate.

The hands are short and subequal and the front rostrate, as in the *Clibanarii*; but the position of the hand is similar to that of the *Paguri*, the fingers having an up and down motion, instead of a lateral, owing to the different mode of articulation of the hand with the carpus.

ANICULUS TYPICUS, *Dana*.

Plate 29, fig. 1, animal, natural size.

Raraka, Waterland, and Carlshoff Islands, Paumotu Archipelago; also, Wakes Island, Pacific Ocean.

Colour, while living, as in the figure, much brighter in its tints than in Quoy and Gaymard's figure, *Voy. de l'Uranie*, pl. 79, fig. 1. Length of specimen, four inches. The anterior part of the carapax has the median region distinct, and moreover, what is unusual in this genus, the extramedial and intramedial areolets are distinct, the latter having the form of a narrow arrow-head.

*Pagurus aniculus*, FABR., *Supp.*, 411; OLIVIER, *Enc.*, viii. 640; EDWARDS, *Crust.* ii. 230; QUOY and GAYMARD, *Voy. de l'Uranie*, 531, pl. 79, f. 1.

GENUS CLIBANARIUS.

*Pedes antici subæqui. Digiti in plano horizontali claudentes, apice cornei, instar cochlearis excavati. Frons dente parvulo rostratus.*

Anterior feet subequal. Fingers moving in a horizontal plane, corneous at tips, spoon-excavate. Front having a small tooth as a beak.

The hands in the species of this genus are usually short and depressed, and commonly are covered above with short and small,



tubercle-like spines and scattered hairs. Either the right or left hand may be the larger, and the sexes often differ in this particular. The acicle of the outer antennæ is short, seldom exceeding half the length of the eyes. The basal scale of the eyes is very small, much smaller than in *Pagurus*. The eyes vary much in length, but are usually slender; sometimes they are nearly half longer than the breadth of the carapax in front.

As the specific name of a characteristic species, the *Pagurus clibanarius*, is here adopted for the name of the genus, this species may be called the *Clibanarius vulgaris*.

The Clibanarii are remarked upon as forming a distinct group by De Haan (*Faun. Japon.*, p. 210), yet he did not make them a separate genus.

The species may be arranged in two divisions, one having the tarsus as long as the preceding joint or longer; and the other having it shorter. In the latter, the tarsus is often much compressed, and is vertically much wider at base than at middle.

1. *Tarsus articulo pedum penultimo non brevior.*

CLIBANARIUS LINEATUS (*Edwards*), *Dana*.

Plate 29, fig. 2 *a*, animal, enlarged two diameters.

Upolu, Samoan Islands, in shallow waters, along the coral reefs.

Length, one and one-fourth inches. Eyes distinctly shorter than front of carapax. Anterior region of carapax but slightly oblong. Carpus and hands rough above with small, acute, spiniform tubercles, and pilose. Right hand a little the longer in both sexes. Legs of second and third pairs moderately elongate, three narrow lines of dark colour (red in dead specimen) on outer surface of fifth joint, and five in all to this joint, with a few lax hairs on the surface, and inferior margins not furnished with tufts of stiff hairs. Tarsus as long as preceding joint, subterete; two stripes of dark colour on its outer surface. Outer surface of fifth joint of left leg of third pair convex. Basal scale of eyes pointed and denticulate at apex.

This species agrees quite closely with Edwards's description of his

*lineatus*; the nearly naked character of the second and third pairs of legs, corresponds with his statement. In this respect the *striolatus* is quite different.

## CLIBANARIUS STRIOLATUS.

*Regio carapacis antica fere quadrata. Oculi graciles, margine carapacis antico vix breviores, squamâ basali angustâ, acuminatâ, bidentatâ. Pedes antici subæqui, manibus brevibus, carpis quoque supra spini-tuberculatis et pilosis, sinistrâ maris paulo majore. Pedes 2di 3ti que supra infraque paulo hirsuti, tarso subterete, non brevior quam articulus penultimus, sinistro 3tii paris articulo 5to extus parce convexo, acie rectangulatâ superne instructo.*

Anterior region of carapax nearly quadrate. Eyes slender, about as long as anterior margin of carapax, basal scale narrow, bidentate at apex. Anterior feet subequal, hands short, and with the carpus spini-tuberculate above and pilose, the left in male slightly the larger. Feet of second and third pairs short hirsute in tufts on upper and lower sides, tarsus subterete, as long as preceding joint, fifth joint, left side, of third pair slightly convex and having a right-angled edge above.

Plate 29, fig. 3 *a*, animal, enlarged one and a half diameters; *b*, basal scale of eye-peduncle; *c*, last two joints of third pair of legs, right side.

Coral reefs of Tongatabu and Feejees.

Length, two inches. Colour, a tawny or ochreous yellow, with deep brown thread-like longitudinal lines on the legs; three of these lines on either hand, five on the fifth joint of the second and third pairs of legs. There are numerous tufts of short hairs along the under side of the tarsus. The eyes are much longer than in the *lineatus*, and the legs less naked, the fifth joint having tufts of hairs below. Moreover, the left hand instead of the right is the larger in males.



CLIBANARIUS LONGITARSIS (*De Haan*), *Dana*.

Caldera, Mindanao.

Length of body, two inches. Eyes shorter than the frontal margin. Anterior legs a little unequal, the right the larger in males; hands elongate (longer than in other *Clibanarii* described), granulate above and somewhat pilose.\* Tarsi longer than the preceding joint, subterete, with numerous tufts of hairs above and below; similar tufts scattered on upper and lower surfaces of fifth joint, and also on preceding. Fifth joint of left leg of third pair somewhat flattened on outer surface (though still convex), and having an obtusish edge above, which is a little pilose, the surface below naked, or nearly so. A longitudinal band of white, bordered by red, along outer surface of second and third pairs. Basal scale of eyes pointed.

*Pagurus longitarsis*, DE HAAN, Faun. Japon., 211, pl. 50, f. 3.

*Pagurus asper* ? EDWARDS, Ann. des Sci. Nat., 1848 [3], v. 62.

2. *Tarsus compressus articulo pedum preecedente brevior.*

## CLIBANARIUS ÆQUABILIS.

*Oculi elongati, margine carapacis antico vix breviores. Manus sive æquæ sive sinistra major. Pedes 2di 3tii nudiusculi et nitidi, superficie externâ nudâ, marginibus paulo hirsutis, pedibus paris tertii inæquis, articulo sinistro penultimo extus planiusculo, nudo, et superne subacuto.*

Eyes elongate, hardly shorter than anterior margin of carapax. Hands equal, or the left a little the larger. Feet of second and third pairs nearly naked and shining, outer surface naked, margins somewhat hirsute; feet of third pair unlike, the penult joint on left side flattened on outer side, and having a subacute edge above.

\* The *Pagurus symmetricus* of Randall (Jour. Acad. Nat. Sci., viii. 133, 1840), is another species of *Clibanarius*, having the tarsus a fifth longer than the preceding joint.

Plate 29, fig. 4 *a*, from a Madeira specimen, enlarged two diameters; *b*, hand of same; *c*, part of left leg of third pair, *ibid.*; *d*, from a Tahiti specimen, enlarged four diameters; *e*, hand, side view, of same; *f*, part of left leg of third pair, *ibid.*

Madeira and Porto Praya, Cape Verds; also, Tahiti, Society Islands.

Length, three-fourths of an inch. The alcoholic specimens from Madeira, have no bandings in the colour; the dark reddish brown shade indicates that they were of a uniform dark tint, excepting the tarsi, these being white for three-fourths the length, and then brownish red at base of claw, with the claw black. The specimen from Tahiti, a *dried* one, has the legs dark blue, but not striped with colour. The upper surface of the carpus partakes of the flattening that characterizes the hand, and has the same short conical spines. The eyes are as long as the base of the outer antennæ, but a little shorter than the base of the inner. The species differs from the *virescens* in being less hairy, the legs more compressed, the outer surface of the third and second pairs of legs naked, the tarsus also much more flattened and wider at base. It is nearer the *inæqualis* of De Haan (Faun. Japon., 210, Plate 50, fig. 2), but the right hand is not the larger, or if exceeding the left in size, as is rarely observed, it is but slightly larger; commonly the hands are equal, or the left is a little the longer.

#### CLIBANARIUS ZEBRA.

*P. æquabili affinis. Oculi colore supra unilineati, margine carapacis antico paulo breviores; squamâ basali subovatâ, denticulatâ. Manus maris dextra paulo major. Pedes 2di 3tii colore pauci-lineati, unâ linedâ obscurâ externâ tantum, supra infraque pilosi, latere externo parce pilosi, articulo pedis 3tii sinistri 5to extus paulo complanato et nudiusculo, tarso valde compresso, brevi.*

Near the *æquabilis*. Eyes having a longitudinal line of colour above, not as long as anterior margin of carapax. Right hand a little the larger in males. Feet of second and third pairs with a few stripes



of colour, one dark stripe only on outer surface, pilose above and below and somewhat so on outer surface, fifth joint of third leg of left side somewhat flattened, nearly naked on outer surface, and having an edge above; tarsus much compressed and short.

Plate 29, fig. 5 *a*, part of animal, enlarged four diameters; *b*, *c*, hand; *d*, part of right leg of third pair.

Sandwich Islands.

Length, three-fourths of an inch. In its striations of colour along the legs the species resembles the *lineatus*, but the striations are fewer, but one of dark colour on the outer side, one below, one above, and one on the inner side. The anterior region of the carapax is but little oblong. The hands are nearly as in the *æquabilis*; but usually less rough, the tubercles more like granules; the carpus is more tuberculous than in the *virescens*, and less flattened than in the *æquabilis*. In females, the hands are equal or very nearly so. Unlike the *virescens*, the tarsi are nearly naked on the dorsal margin, and the hairs below are shorter and fewer.

The legs are more hairy than in the *æquabilis*, the eyes shorter and less slender; and the sides of the anterior region of the carapax have more and longer hairs. In other respects, excepting the stripes of colour, the species are very similar.

CLIBANARIUS VIRESCENS? (*Krauss*), *Dana*.

Plate 29, fig. 6, *a*, *b*, different varieties.

Feejee Islands, island of Ovalau (fig. 6 *a*), and Viti Lebu, near Rewa (fig. 6 *b*); also, Balabac Passage and Sooloo Sea.

Length, one inch. General colour of specimens varies from grayish green to dark green, brownish green, and also yellow; fingers of hand, yellowish white or yellow, with tips black. Tarsi, in all specimens collected, yellow or yellowish white; eyes black, outer antennæ dull transparent blue. Alcoholic specimens lose the colours, but have the tarsus and tips of fingers whitish. The hands are small and

equal; the four following legs are hairy on outer as well as inner surface, the tarsi rather short and tapering, hardly as long as preceding joint, and with the hairs on both margins long (much longer than diameter of tarsus). The anterior portion of carapax rather longer than broad; a small median point to front, and one still smaller outside of eyes. Eyes not longer than front margin of carapax, whole length equalling base of outer antennæ, and not longer than inner antennæ, twice as long as acicle of outer antennæ; basal scale pointed. Hands with small conical spines of a whitish colour. Left leg of third pair differing but little from right, penult joint narrow.

This species does not appear to differ essentially from the *P. virescens* of Krauss, Südaf. Crust., p. 56, pl. 4, f. 3, 1843. Yet in the figure of that species, the carpus is not more than half as long as broad, and the tarsi, although yellow, are banded with olive-green near middle; moreover, the hairs of the tarsus do not appear to be as long as in our specimens.

#### CLIBANARIUS BRASILIENSIS.

*Regio carapacis antica paulo oblonga; rostrum bene triangulatum. Oculi gracillimi, margine carapacis antico non breviores, squamâ basali valde truncatâ, brevissimâ non longiore quam latiore, pilis sublongis margine apicali instructâ. Pedes antichi æqui, manu dextrâ parce majore. Pedes 2di 3tii persparsim hirsuti, subnudi, tarso perbrevis, articulo 5to paris 3tii extus subcomplanato, parce convexo, supra subcarinato. Color pedum paucilineatus.*

Anterior region of carapax a little oblong; beak neatly triangular. Eyes very slender and long (not shorter than anterior margin of carapax), basal scale truncate, and, therefore, very short, not longer than broad, with a few longish hairs on summit margin. Anterior feet subequal, right hand of male slightly the larger hirsute. Feet of second and third pairs very sparsely rather long hirsute, appearing nearly naked, tarsus very short, fifth joint of third pair somewhat flattened but still convex on outer side, subcarinate above. Colour of the legs in lines.

Plate 29, fig. 7 a, part of body, enlarged three diameters.



## Rio Janeiro.

Length, one and one-fourth inches. The basal scale differs from that of all the other related species in being truncate, and hence rather broader than long; it bears a few longish hairs at extremity. The tarsi are not more hairy than the rest of the legs; they are compressed as in the *aquabilis*.

CLIBANARIUS CORALLINUS? (*Edwards*), *Dana*.

Plate 29, fig. 8 *a*, part of body, enlarged two diameters; *b*, front, with basal scales of eyes, much more enlarged; *c*, right arm and hand, outer view; *d*, part of leg of third pair, right side; *e*, same, left side.

Wakes Island, Pacific Ocean, north of the Equator; also, Feejee Islands.

The hand in our specimens is very short and thick, and the arm is not half longer than its vertical breadth. The anterior region of the carapax is quite oblong, and the V-shaped suture in its posterior part is not distinct. The eyes are slender and longer than the anterior margin of the carapax. The legs are stiff hirsute on the margins, the hairs nearly or quite as long as the breadth of the fifth joint; the fifth joint is little compressed; that of the left side third pair is much flattened on outer side, and rough hirsute on this outer surface. In this hirsute surface, the species differs from all the other *Clibanarii* described. The tarsus is much shorter than the fifth joint, and hirsute in thick tufts. Colour of alcoholic and dried specimens, deep red. Length, one and a half to two inches.

The *P. corallinus* is imperfectly described by Edwards (in the *Annales des Sci. Nat.*, for 1848, 3d ser., v. 63), and it is, therefore, difficult to decide upon the identity of our specimens with his species. The specimens also answer to the description of the *P. crassimanus*, EDWARDS, as far as it is given; but in the recent memoir by Edwards, just referred to (p. 62), the *crassimanus* is removed from the group of the "*Æquimanes*," and placed among the "*Senestres*." Owing to the uncertainties, we had named our specimens the *obeso-manus* (Proc.

Acad. Nat. Sci. Philad., 1851), a name which may still hold, if the species prove distinct. The Feejee specimen, from which it was first described, was a much injured alcoholic one, and the hairs were mostly broken from the mutilated legs.

## CLIBANARIUS HUMILIS.

*Oculi breves et crassiusculi, fronte breviores, squamâ basali triangulatâ. Pedes primi subæqui. Pedes 4 sequentes crassiusculi, sparsim pilosi, tarso terete. Color non lineatus.*

Eyes short and stoutish, shorter than front, basal scale triangular. Anterior feet nearly equal; four following feet rather stout, sparsely pilose, tarsus terete. Not striped with colour.

Plate 29, fig. 9, animal, natural size.

Feejees and Tongatabu; found abundantly near high water mark, under masses of dead coral.

Length, about one inch. General colour, dark green. Tarsus of legs of second and third pairs, reddish orange, with black tips; preceding joints, same orange colour, excepting apical portion, which is dark green or greenish black. Peduncles of eyes pale yellow, passing into red near centre; the basal scale dark green. Second antennæ, orange, excepting base, which is green. First antennæ, green, with extremities deep orange. Abdomen, dirty brownish green to grayish green.

This small species is readily distinguished by its colours; also by its short stout eyes, nearly equal small hands, without trenchant upper edge.

We write off this description from the notes and drawing taken on the spot, as we have not the specimens to verify it. It has shorter and stouter eyes than either of the allied species. The *virescens* occurs in the same seas, and is very different in its habit, colouring, and the proportions; moreover, it is found about the outer or more exposed reefs, while the *humilis* was met with under stones near high tide level.



## FAMILY II. CENOBITIDÆ.

CENOBITA OLIVIERI, *Owen*.

Paumotu Archipelago, at Clermont Tonnerre, and Waterland Islands; Tahiti.

Colour, cinnabar red, brownish red. Peduncles of eyes rough granulous above, very much compressed, height more than half the length; cornea triangular, vertically oblong. Surface of carapax with obsolescent granuliform tubercles, but nearly smooth. Large hand with short and small but spiniform tubercles, which are obsolescent below, and crowded above especially on the moveable finger; they have in general corneous tips. There is a dense tuft of short hair along upper margin of both hands. Inner surface of hands flat or even excavate in upper half. The superior of the flagella of the inner antennæ about double the length of the inferior. Tarsi short (but very little longer than preceding joint), and very stout, with short spiniform tubercles having black corneous tips; and rest of legs similar in surface, except that the points are less crowded. Upper surface of tarsi rounded; under surface of the two left legs flattened, and longitudinally along middle low cristate with denticulate edge to crest. A short pubescence on some of the joints of the legs.

*Pagurus clypeatus*, OLIVIER, *Encycl. Meth. Ins.*, viii., p. 643, pl. 311, f. 1.  
*Cenobita Olivieri*, OWEN, *Crust. Blossom*, p. 84.

## CENOBITA BRUNNEA.

*Regio carapacis antica convexa, nuda, lævis. Oculi fronte vix breviores, læves. Pedes spinis conicis perbrevibus apice corneis armati; antici subæqui, manibus sparsim hirsutis, margine superno dense pilosis, carpo sinistro supra gibboso; 2di 3tii laxè sparsimque hirsuti, tarso subterete, prælongo, longiore quam articulus 5tus, infra spinulis male seriatis.*

Anterior region of carapax convex, naked, smooth. Eyes hardly shorter than the front, smooth. Feet armed with short conical spines having corneous tips; anterior pair subequal, hands sparsely hirsute, upper margin of hand dense pilose, carpus of left leg having upper surface gibbous; second and third pairs lax and sparsely hirsute, tarsus subterete, very long (longer than fifth joint), spinules of under surface imperfectly seriate.

Plate 29, fig. 10 *a*, animal, natural size; *b*, side view, showing antennæ.

Upolu, Navigator Group. Found in the forests, some miles from the sea. The shell covering the abdomen is like the shell of a nutmeg.

Length, about three inches. Colour, dark brown. The general characters are similar to those of the *Olivieri*; but the legs are longer and hairy, the tarsus more slender, the eye-peduncles smooth instead of granulous, carapax also smooth, and moreover naked. The shorter flagellum of the inner antennæ is about one-third the length of the longer.

#### CENOBITA RUGOSA, *Edwards*.

Plate 30, fig. 1, animal, natural size.

Paumotu Archipelago, at Raraka; Samoan Islands; Tongatabu; Feejee Archipelago; Sooloo Sea. Common on bushes and on the ground, often fifty rods or so from the sea.

Length, often three inches. Colour, bluish and brownish gray; generally a large brown spot on the outer surface of the hand, and sometimes smaller ones on the four following legs. Eyes, black; peduncles, grayish. The hands are very unequal and a little pubescent. The granules of the surface are not acute. The eye-peduncle is much flattened, but the outer of the upper edges is obtuse or rounded.

*C. rugosa*, EDWARDS, Crust., ii. 241.

*Cenobita clypeata*, OWEN, Crust. Blossom, p. 85, pl. 25, f. 3.



Var. *pulchra*.—Plate 30, fig. 2 *a*, *b*, represents a specimen from Pitt's Island, Kingsmill's Group, Pacific Ocean; it is probably a variety of the *rugosa*.

Length, two inches. Carapax, having a tinge of blue, with a faint blush of red on hinder part; abdomen, sulphur-yellow on outer surface; legs, mostly bluish, with a large purplish spot on each joint; peduncles of eyes, burnt sienna; eyes, reddish burnt sienna; antennæ deep red, a little brownish. Margin of anterior part of carapax hairy. Antennæ hardly longer than carapax; inner more than two-thirds the length of the outer. Legs scabrous; also, somewhat hairy, excepting anterior pair and third pair left side. Hand scabrous inside and outside from acute granules on the surface; fingers towards tips with the granules black and more numerous than elsewhere. A dense tuft of auburn hair on inner surface of hand, near upper margin.

#### CENOBITA CARNESCENS.

*Regio carapacis antica plana, scabricula, lateribus quoque planis. Oculi fronte longiores, plus duplo longiores quam alti, valde compressi, laminâ basali triangulatâ, acutâ. Pedes antici inæqui, sinistro majore, superficiem granuloso, carpo paulo brevior quam manus, brachio apicem oblique plano-truncato. Pedes quatuor sequentes fere nudi, parce pubescentes, articulo ultimo scabriculo.*

Anterior part of carapax flat, finely rough, sides also flat. Eyes longer than front, more than twice as long as high, very much compressed, basal scale triangular, acute. Anterior feet unequal, left hand the larger, surface a little rough, carpus somewhat shorter than hand, arm with apex obliquely flat truncate. Four following feet nearly naked, sparingly pubescent, last joint finely scabrous.

Plate 30, fig. 3 *a*, animal, natural size; *b*, animal, withdrawn into the shell, showing how the shell is closed by the feet.

Pacific, in the Paumotu Archipelago, at Honden Island; also, at

Raraka, Vincennes, Carlshoff, and Waterland Islands. Collected August, 1839. Found mostly in a white Cerithium; also, in Naticas, &c.

Length, one and one-fourth to one and one-half inches. Colour, a light flesh-tint; anterior portion of carapax, nearly white; legs, whitish, but a flesh tint towards the base, and a little brown spotted with white at base of some of the joints; abdomen light flesh-tint or white; antennæ deep flesh-colour; pigment of eyes brown.

This species resembles the *rugosa*, but is more square in form, less hairy in its legs, and much more delicate in shade of colour. The back and sides of carapax anteriorly meet in a right angle, the edge being neat and exact. The eyes are longer and more compressed triangular, and the edges are more trenchant, not at all rounded. The arm of the anterior legs is wedge-shape, with a flat surface, being trenchant above, and having the sides quite flat; and the oblique truncation of the apex produces a triangular flat surface, slightly rounded above. The large hand is without the series of rugules, characterizing the *rugosa*. The flagellum of the second antennæ is nearly as long as the carapax.

#### CENOBITA CLYPEATA.

Balabac Passage.

Length, four and three-fourths inches. Front narrow. Upper flagellum of inner antennæ about one-fifth as long as lower. Anterior region of carapax convex, and other characters as mentioned by Edwards for the *clypeata*. The large hand (Plate 30, fig. 4 *a*) is two inches two lines long; breadth, one and a half inches; inner surface near upper margin naked; outer surface hardly smooth in any part, but covered with quite small tubercles, with horny summits and sub-acute. Tarsi quite rough with similar points and sparsely hirsute.

Var. *brevimanus*.—Has the characters of the above, but the larger hand (Plate 30, fig. 4 *b*) is but little longer than broad, nearly circular in outline, and very convex and nearly smooth on the outer surface, the length, sixteen lines; breadth, thirteen and a half lines.



Antennæ and other characters like the above. Length of body, two and three-fourths inches.

*Cancer clypeatus*, HERBST, ii. 22, pl. 23, f. 2.

*Pagurus clypeatus*, FABRICIUS, Supp., p. 413.

*Cenobita clypeata*, EDWARDS, Crust., ii. 239. Not *C. clypeata* of OWEN, Crust. Blossom, 85, pl. 25, f. 3.

#### BIRGUS LATRO, *Leach*.

Plate 30, fig. 5 *a*, coloured sketch, somewhat reduced from the natural size, made from life, by A. T. Agate, one of the artists of the Expedition. The death of Mr. Agate, and the loss of the specimens by the wreck of the Peacock, have prevented finishing the sketch in some parts; *b*, view of part of inner surface of the stomach, by the author, natural size.

From various islands of the Paumotu Archipelago (the sketch was from a specimen taken at Honden Island); also, from Swain's Island, north of the Navigator Islands.

The loss of our specimens prevents us from making a direct comparison with the species of the East Indies. From notes taken in the Paumotus, we mention the following characters.

Length, nine inches; of carapax, four and one-half inches; greatest breadth, four and seven-eighths inches; second pair of legs in a female, nine inches. The medial line of the posterior part of the carapax is occupied by two narrow wedges, the acute angles of the wedges meeting just posterior to the centre. (These are represented as one piece in the *latro*, as figured in fig. 1, pl. 43, Cuv., by Edwards.) The anterior part of the carapax is marked with transverse linear depressions, about one-fourth of an inch long. The abdomen has at extremity two small crustaceous plates, the penult of which has very minute appendages, and is pubescent, though smooth. Abdomen below laterally verrucose, with the verrucæ pubescent; covered with short imperfectly jointed setæ of very peculiar appearance along its medial space.

Eyes on the exterior part of the extremity of compressed pedicels; outer margin of pedicel uneven. The exterior antennæ are about two-thirds as long as the body. The nasal opening in males is irregularly semilunar; the depth of the cavity is nearly that of the

thickness of the joints. At its apex is a small puncture, or what appears to be one. Within, the cavity was lined by a cellular tissue and covered on all sides with naked hairs that crossed in every direction, which nearly fill the cavity. In a female, the nasal opening was not one-sixth the size in the male, and was triangular.

Fingers with the dentations like molars in form, but having a cutting edge. Surface of carpus and hand marked with short transverse ridges, which are furnished outwardly with a sharp projecting edge. Similar ridges on carpus and arm. Tarsi of second and third pairs of legs thickly hispid with short spines; except outer surface, on which the spines are sparse.

The colours vary. The sketch represents a female. The carapax is orange, passing to a rich brownish tint on the posterior part; arms and the following legs in part reddish brown, with some bright blue; hand, nearly white. In males, carapax red, brownish red or crimson, with the transverse depression of the carapax whitish.

The *Birgus* lives in holes in the soil, at a distance from the sea. On approaching the holes, they come out slowly as if in search of their prey; their motion is slow, and though of large size, they are quite timid. They walk either backward or forward, but usually forward. When approached, they raise one of the legs of the second pair very awkwardly, and bring it down with a show of force, which is found, on exposing the hand to the blow, to be quite weak.

*Cancer crementatus*, RUMPHIUS, Mus., pl. 4; SEBA, iii. pl. 21, f. 1, 2.

*Cancer latro*, HERBST, ii. 34; pl. 24.

*Birgus latro*, LEACH, Trans. Linn. Soc., vol. xi.; EDWARDS, Crust., ii. 246, et Cuv., pl. 43, f. 1; QUOY and GAIMARD, Voy. de l'Uranie, pl. 80.

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#### SUBTRIBE VIII. ÆGLEIDEA.

THE peculiarities already stated, show important differences both in the carapax, abdominal appendages, and branchiæ, between this group and the Galatheidea, and others, no less great, between it and the Porcellanidea. Only one known genus is here included.



GENUS *ÆGLEA*, Leach.

The following are the essential characters of this genus.

Body much depressed. Carapax elongate ovate, narrow anteriorly and short rostrate, with orbit-excavations either side of beak. Abdomen partly inflexed; pairs of appendages in male obsolescent, in female oblong. Antennæ of second pair without a basal scale or acicle; of first pair without fossettes, situated posterior to the eyes. Anterior feet stout chelate; six following similar, pediform; fifth pair small and slender, obsoletely chelate, inflexed under the carapax.

The antennæ of the second pair in an upper view of the animal, project from beneath the anterior angles of carapax, towards the extremity of the beak, before reaching which, the flagellum arises and extends forward and outward. The base is four-jointed, the second and third joints quite short, and each triangular in one vertical section, the outer side of the second, and the inner of the third being extremely short.

The *mandibles* have a trenchant longitudinal edge, which is a little dentated. Exterior maxillipeds narrow pediform.

*Branchiæ*, eleven on each side in a uniform series, excepting the fifth and seventh, which are much smaller than the adjoining; they consist of long, slender, cylindrical vessels, arranged thickly on one side of a curving pedicel. Anterior legs unequal.

Fifth pair of legs quite small, flexed, and concealed below, six-jointed. At base in male an oblong process, which appeared to be sexual.

No abdominal legs to first segment; on the following joints in male, they are extremely small, two-jointed; in female, long and slender.

Abdomen seven-jointed; the first segment very short, and narrower than the following; the following four similar, the first largest, last segment subtriangular.

*ÆGLEA LEVIS* (Latreille), Leach.

Plate 30, fig. 6 *a*, animal, natural size; *b*, carapax, showing sutures,

and areas lettered; *c*, side view of carapax; *d*, extremity of abdomen; *e*, sternum; *f*, branchiæ.

In shallow fresh-water streams, Chili, from beyond the Cuesto del Prado, on the road from Valparaiso to Santiago, sixty miles from the sea; abundant, swimming generally over the bottom. Collected, April, 1839.

Length, one and a half to two inches. Colour, olive-green. Carapax depressed, posterior angles rounded, a little pubescent in some parts, crossed by a transverse suture; in anterior region a U-shaped depression, in posterior, longitudinal sutures dividing the surface across into three nearly equal areas; also, a submarginal suture either side; antero-lateral margin bi-emarginate, extraorbital spine prominent, acute, with a small tooth on inner side near apex, beak acute carinate above. Eyes rather shorter than beak. Anterior feet very stout. Hands unequal, right one the larger, very broad, half as broad as carapax, subrhomboidal, surface somewhat scabrous, outer margin nearly entire, inner margin anterior to finger, short, somewhat compressed and dilatate; finger and thumb denticulate, inner margin trenchant; carpus and arm three-sided, within acutely dentate, and dentato-costate above.

Abdomen laterally pubescent, and sometimes slightly pubescent throughout. Seventh segment not half as broad as preceding, subtriangular, obtuse, having a longitudinal suture, and a slight emargination at apex, ciliated, caudal appendages either side make the caudal extremity as wide as preceding segment; basal joint lamellar, oblong transverse, broadest anteriorly; lamellæ obovate, ciliate, inner one the larger.

Sternum triangular, the anterior piece very narrow; the pieces gradually increase in width backward, the four anterior pieces of equal length, each a very short trapezium in form. Fifth piece very short, and consisting of a medial portion and a lateral, the lateral much smaller than the medial.

First antennæ have the flagella not half as long as base, the stouter one ten-jointed, joints transverse, and a few short hairs at inner apex of each; the other flagellum extremely slender, ten-jointed, naked. Second joint of base arises laterally from inner side of first, oblong; third joint a little shorter than second. The base when extended



reaches as far as apex of beak. Second antennæ long and slender; flagellum about as long as carapax, naked, joints short; base extends a little beyond line of extremity of beak. Fourth, fifth, and sixth joints of exterior maxillipeds together about as long as second and third. Legs of second, third, and fourth pairs nearly equal, of moderate length, pubescent especially towards their extremities. Sixth joint short hirsute, longer than preceding joint; fifth joint but a little longer than fourth, and each shorter than third. Tarsus terminates in a short acute claw. Fifth pair six-jointed, third joint longest.

Some of the females, at the time taken (in April), had eggs, and one male had just shed his skin. The female differs but little from the male: the first pair of feet was a little smaller in females.

This species has been attributed to the shores of Chili. The specimens procured were obtained by the author from a fresh-water stream, as above stated.

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#### SUBTRIBE IX. GALATHEIDEA.

THIS subtribe includes the genera *Galathea* and *Grimothea*. Leach proposed, also, the genus *Munida* for certain species related to *Galathea* which have a tricuspidate front, and more slender legs than in the *Galatheæ* then known. The slender form of the legs proves not to be distinctive; for we have a species that should be referred to *Galathea*, in which the legs are peculiarly slender. But the form of the front is a striking characteristic, and it allies the species to the *Grimotheæ*. Moreover, we know of no tropical species of the *Munidæ*, and in this respect they are like the *Grimotheæ*. We therefore follow Bell\* in sustaining Leach's genus, believing it entitled to the rank of a subgenus at least, if not of higher grade.

\* *British Crustacea*, p. 206.

## GENUS MUNIDA.

MUNIDA SUBRUGOSA? (*White*), *Dana*.

Plate 30, fig. 7 *a*, animal, natural size; *b*, caudal extremity; *c*, exterior maxillipeds.

Hermite Island, Tierra del Fuego. Obtained by Lieut. Case.

Length, two and a half to three inches. Colour, deep red, or red faintly brownish. Carapax with a moderately long beak (less than half the carapax in length), anterior angles spini-acute, on upper surface behind beak two spines, sides with about six small acute teeth, median area with defined outline; outer antennæ longer than carapax. Anterior feet naked, or nearly so, narrow, very scabrous, apices of carpus and arm with several spiniform teeth, hand not stouter than carpus, inner margin spinulous, outer unarmed, finger exceeding half the length of hand, extremities of fingers incurved. Six following feet subequal, moderately pubescent. Fifth pair in its folded condition not half as long as carapax. Segments of abdomen laterally acute.

Of the transverse ciliated lines of the carapax, the four posterior extend quite across the carapax; the first of these four is partly in the line of the boundary, enclosing the median area; anterior to this boundary there are three ciliate lines crossing the area. Joints of abdomen similarly marked. For extremity of abdomen, see figure *b*. The first abdominal segment has no appendages in the female; the segment lies partially under the preceding and following.

The maxillipeds when thrown forward reach a little beyond the beak; second and third joints largest, the third with a few hairs near base; last three joints nearly cylindrical. The thoracic segment to which the fifth pair of legs is attached has free motion like the following abdominal segments.

*Galathea subrugosa*, A. WHITE, Voyage of Erebus and Terror, pl. 3, f. 2. Mr. White's specimens were from the Auckland Islands.



GENUS GALATHEA, *Fabricius*.

## GALATHEA LATIROSTRIS.

*Rostrum latum, latitudine ejus medianâ non duplo longius, lateribus convexis et cum dentibus tribus subovatis alioque dente obsoleto ornatis. Latera carapacis obsoletè dentata; area mediana non circumscripta. Oculi sat breves, apice pedunculi ciliati. Pedes primi lineares, manu carpoque sparsim spinulosis et parce laxè setosis, manu non crassiore. Pedes 6 sequentes subœqui, laxè setosi. Abdomen juxta articulationem basalem utrinque rotundatum.*

Beak broad, not twice as long as its breadth at middle, with three subovate teeth on either side, and another obsolescent tooth. Sides of carapax obsoletely dentate; no stomachal area. Eyes rather short, ciliate at apex of peduncle. First feet linear, hand and carpus sparsely spinulous and laxly and sparingly setose, hand not stouter than carapax. Six following feet subequal, lax setose. Abdomen near its base on either side, rounded.

Feejees, Island of Viti Lebu, among corals and in cavities of the coral rock.

Plate 30, fig. 8, animal, enlarged, but figure not complete in the antennæ.

Length, one-third of an inch. Nearly colourless. Beak broad and short, teeth prominent. Transverse scabrous lines of carapax nearly straight transverse, but undulate, and many interrupted. Fifth pair of legs, when folded up, much shorter than half the length of carapax.

## GALATHEA SPINOSO-ROSTRIS.

*Rostrum latum, triangulatum, parce oblongum, apice tenuiter acutum et utrinque 4 dentibus spiniformibus tenuibus armatum, spinis posticis parvulis, in superficie pone has spinas spinulis duabus instructum. Pedes antici graciles, tenuiter spinosi. Area mediana nulla. Abdomen juxta basin utrinque rotundatum.*

Beak broad and large, triangular, but little oblong, slenderly acute at apex, and having four slender spines or spiniform teeth on either side, the posterior spines small, and between them, on surface of carapax, two minute spinules. Anterior feet spinous, slender. No median area. Abdomen near base either side rounded.

Plate 30, fig. 9 *a*, front of carapax, much enlarged; *b*, second and third joints of outer maxillipeds, *ibid.*; *c*, anterior legs, *ibid.*

Sandwich Islands.

The breadth of the beak at base is full two-thirds its length, and the spiniform teeth either side of it are long and narrow triangular. The third joint of the outer maxillipeds is rather longer than the second, and has two spines on inner side, one of them apical.

#### GALATHEA VITIENSIS.

*Rostrum oblongo-triangulatum, dimidio carapacis multo breviores, lateribus rectis, regulariter 4-serratis. Carapax lateribus totis paulo dentatus, angulo antico prominente, acuto; areâ medianâ circumscriptâ, posticè bene semicirculari. Abdomen juxta articulationem basalem utrinque rotundatum.*

Beak oblong triangular, one-third as long as carapax, sides straight, regularly four-serrate. Carapax with the sides for their whole length somewhat dentate, anterior angle prominent and acute. Median area circumscribed, the outline behind regularly semicircular. Abdomen at base on either side rounded.

Feejees, about corals.

Plate 30, fig. 10 *a*, animal, enlarged, figure not completed; *b*, portion of flagellum of second antennæ, more enlarged.

Length, one-fourth of an inch. Nearly colourless. The abdomen, as seen in an upper view, flexed so as to be in its natural position, is very broad cordate in outline, rather broader than long, with the



outline either side continuous from the rounded anterior angles, and not interrupted or notched.

GALATHEA LONGIROSTRIS.

*Rostrum angustum, recte acuminatum, elongatum, dimidio carapacis fere longius, lateribus rectis, minutè 5-6 serrulatis. Latera carapacis obsolete serrulata. Pedes toti tenues, sparsim pubescentes; primi corporis longitudine, manu lineari, parce latiore quam carpus. Pedes secundi quartis sat longiores. Oculi breves. Abdomen juxta articulationem primam utrinque acutum.*

Beak long and narrow, straight acuminate, fully as long as half the carapax, sides straight and minutely five to six serrulate. Sides of carapax obsoletely serrulate. Feet all slender and sparsely pubescent. First pair as long as body; hand linear, slightly broader than carpus, finger not half as long as hand. Second pair considerably longer than fourth. Abdomen at base on either side acute.

Plate 30, fig. 11, animal, enlarged, figure not complete.

Feejees, brought up on a Comatula, from a depth of ten fathoms.

Length one-third of an inch. Colour, purplish black, with two longitudinal yellowish white bands either side of centre; legs, same colour, except parts of some joints and fingers of hand, which are yellowish white. The abdomen is pubescent. The carapax is broadest just posterior to middle, and the abdomen either side of basal articulation projects and is acute.

GALATHEA INTEGRIROSTRIS.

*Rostrum laminatum, elongato-triangulatum, acutum, integrum, ad basin super oculos dente minuto instructum. Carapax angulo antero-laterali acutus, superficie rugulis paucis vix interruptis transversim notatâ, areâ medianâ nullâ. Abdomen juxta basin utrinque rotundatum.*

Beak lamellar, elongato-triangular, acute, entire, at base above the eyes furnished with a minute tooth. Carapax acute at the anterolateral angles; surface marked with few transverse lines (about eight), which extend across with few interruptions, no median area. Abdomen near base either side rounded.

Plate 30, fig. 12 *a*, front, showing beak, much enlarged; *b*, second and third joints of outer maxillipeds.

Dredged at Lahaina, Sandwich Islands.

Whole length, two and a half lines. The beak is somewhat concave above. The second joint of the outer maxillipeds is much longer than the third, and is entire on inner margin.

GENUS GRIMOTHEA, *Leach*.

GRIMOTHEA GREGARIA (*Fabr.*), *Leach*.

Plate 31, fig. 1 *a*, animal, enlarged; *b*, one of third, fourth, fifth, or sixth abdominal segments, showing the sternum below; *c*, back view of stomach.

Orange Bay, Tierra del Fuego; abundant, swimming near the surface of the water, hundreds being seen at once in every direction over the harbour.

Length, one to one and a half inches. Colour, deep red. Whole length of exterior maxillipeds about equal to carapax. Each abdominal segment with a small spine on the back, either side of middle. Tarsus of second, third, and fourth pairs of legs longer than half the preceding joint. Eyes oblong, hardly shorter than beak. Facets of eyes *square*. Hand not stouter than rest of leg, fingers hardly longer than half the hand. Hand and carpus densely pilose on inner side. Six following legs very slender and long pilose. Tarsus long and slender. Branchiæ fifteen in number either side; eleven in outer series; and four below the posterior branchiæ of the upper series, composed each of imbricate plates in two series.



## APPENDIX TO THE CRUSTACEA ANOMOURA.

## MEGALOPIDEA.

THE position of the Megalopæ among Crustacea is still a question of much uncertainty. They are placed by Milne Edwards provisionally near to Porcellana, in his division "Porcellaniens;" while De Haan, on account of the structure of the inner and outer maxillipeds and expanded abdomen, places them among the Macroura, in a family of his section Astacini. The researches of different authors, moreover, have proved their general resemblance to the young of some Brachyura, suggesting that they may be immature individuals of some known genus or genera; and Milne Edwards remarks on their resemblance to young Dromiæ.

This uncertainty as to their maturity is sustained by the unusual size of their eyes, a character of young Brachyura, and by the non-discovery, as yet, of females with eggs beneath the abdomen. Still, on the other side, we observe, that the species have often a much wider geographical distribution than the Brachyura, to which we might refer them, are known to have. Moreover, there is a number of genera among them, of very different general form, which still have a close similarity, in the position and structure of the inner and outer antennæ, and general habit; showing more diversity amid their resemblances, than we look for among the young of any genus of Brachyura. These considerations are, however, of comparatively small weight, and therefore, instead of placing the Megalopidea in their proper position among the Anomoura, we have left them for an Appendix.

Their true position, if mature, is probably next to the *Anomoura Superiora*, in a section that might be designated *Anomoura Supermedia*, being between the *Superiora* and *Media*. Like the *Anomoura Superiora* and the *Brachyura*, they have the inner and outer antennæ situated between the eyes; in this point they are far above and much unlike the *Porcellanidea*, and moreover, the inner antennæ fold into fossettes. But, unlike this higher group, the abdomen is elongated, and bears appendages below; and, although when inflexed, it covers

and fills a deep channel in the sternum, as in the *Brachyura*, it has a pair of caudal appendages, like the *Anomoura* of a lower grade, though with but a single plate to each appendage. They are, therefore, superior to the *Anomoura Media* in the cephalic portion of the body, and somewhat inferior to them in the abdomen. Besides, they have not the longitudinal suture near the sides of the carapax common to all *Brachyura*, and in this respect they are *Macroural*.

The *Megalopidea* embrace the two published genera, *Megalopa* and *Monolepis*; and to these we add three others, *Marestia*, *Cyllene*, and *Tribola*. In all, the carapax is rostrate, and except in *Cyllene* and usually also *Megalopa*, it has a prominent point either side of the beak, so that the front is tricuspidate; the inner antennæ are longitudinal or oblique, and fold up into fossettes between the beak and the cusp or tooth either side; the beak is canaliculate above. In *Monolepis* and *Marestia*, the beak is deflexed, so as not to be visible in an upper view. In *Cyllene* and *Megalopa*, the beak projects nearly horizontally, or is obliquely deflected. In *Tribola*, the beak projects nearly horizontally, and also the cusp either side, and the inner antennæ are seen in an upper view, very nearly as in the *Plagusia*. Thus, although the general form of the carapax in these genera is different, still all belong to one type. The outer antennæ are also similar. In the species of the different genera examined, they have a three-jointed cylindrical base, and an eight-jointed flagellum, with commonly two or three long setæ at the apex of the fifth of the joints of the flagellum. The joints are then, first, three basal; then *five* of the flagellum, with the long setæ at the apex of the last; then three terminal. The numbers five and three are typical, as in other *Crustacea*.

We have not had an opportunity of studying either those species of *Megalopa* of Leach in which the beak is nearly horizontal, or the *M. mutica*, in which it is deflected vertically.\* In the genera *Monolepis*, *Marestia*, and *Cyllene*, and probably also in *Tribola*, the posterior legs are capable of overlying the posterior angle of the carapax, and there is a corresponding depression in this surface, which depression is sometimes abrupt and channel-like. The penult pair of legs also admits of being thrown forward over the border of the carapax, and extends

\* Leach describes three other species (not noticed by Edwards) in Tuckey's Expedition to the Zaire (London, 1818), p. 404. The *M. Cranchii* may be a true *Megalopa*; the others have a deflexed beak.



above the base of the eyes, so that the tarsus hangs down in front. The second and third pairs fold up and partially overlap the sides of the carapax, beneath the fourth or penult pair, or, as is sometimes seen, the third pair is thrown forward like the fourth. A species very near *Megalopa mutica*, abundant near the Cape of Good Hope (and referred to this species probably by Krauss, in his *Südafrik. Crust.*, p. 54), is figured on Plate 31, with the legs in the position they had *while the animal was swimming*. This position is not often observed, since the animal, when disturbed, is almost sure to swim with the legs extended; and the hinder legs are mostly like the others in form and habit. On the same Plate, this position is shown for another species from the Sooloo Sea; in the former, the surface of the carapax is simply a little depressed or concave for the folded posterior legs (Genus *Marestia*), while in the latter (Genus *Monolepis*), as shown in figure 5 *b*, there is an abrupt channel.

The channel in the sternum for the abdomen is usually deep, with the enclosing margin rounded either side; but in the Sooloo species (and also Say's *Monolepis inermis*), the channel has a prominent trenchant margin. The outer maxillipeds in the Megalopidea are not in contact; the third joint is considerably shorter than the first, yet sometimes a little oblong; the second joint is truncate at top. The palpus is without a multiarticulate flagellum, a single, rather short joint occupying its place. The second pair of maxillipeds has an elongate one or two-jointed extremity to the palpus; while the main stem is narrow, with the terminal joints also narrow and short.

The eight posterior legs are all rather slender, with the second usually shorter than the third, and the fifth the shortest. The fifth in *Megalopa* terminates in a tarsus like that of the preceding pairs of legs, being so described and figured by different authors. In *Monolepis*, the tarsus of the fifth pair is styliform, but bears at extremity three or four serrate or setulose setæ, longer than the tarsus, the presence of these setæ being one of the peculiarities of the genus, distinguishing it from *Megalopa*, according to Edwards.\* In *Cyllene*, this joint is lamellar, with some longish setæ towards the extremity. In *Tribola*, it is simple styliform, without long setæ, as in *Megalopa*.

The species of *Cyllene* collected by us, have a recurved spine on the under side of the basal joint of the eight posterior legs, like *Meg. Montagu* and *armata* of Leach, besides being similar to them, also, in

\* *Crust.*, ii. 263.

the projecting front; and if Leach's species had lamellar posterior tarsi, the species of *Cyllene* would be true *Megalopæ*. There is, also, another point of resemblance, that is, a tendency to being spinigerous in other parts of the body: the *M. armata* has a spine to the posterior margin of the carapax, while one of our species has two long spines to the posterior part of the thorax, under side. None of the other genera partake of this peculiarity.

The adopted genera of *Megalopidea*, have the following characters:—

- G. 1. *MARESTIA*, *Dana*.—Carapax fronte tricuspidatus, sed rostrum valde deflexum et frons superne visus medio non acutus. Pedes 8 postici ad basin infra non armati; 5ti super carapacem sæpe restantes, depressione ad eos recipiendos parce concavâ; tarso styliformi, compresso, spinis infra armato, paris postici setis longis apice instructo.
- G. 2. *MONOLEPIS*, *Say*.—Carapax fronte tricuspidatus, sed rostrum valde deflexum et frons superne visus medio non acutus. Pedes 8 postici ad basin infra non armati; 5ti minores, super carapacem sæpe restantes, depressione ad eos recipiendos abruptâ, tarso styliformi inermi, depresso, postico setis longis apice instructo. Sterni fossa abdominalis marginibus subacutus et prominens.
- G. 3. *MEGALOPA*, *Leach*.—Carapax fronte rostratus, rostro vix deflexo, acuto. Pedes 8 postici ad basin infra uni-spinigeri; 5ti minores, tarso styliformi.
- G. 4. *CYLLENE*, *Dana*.—Carapax fronte simpliciter rostratus, rostro vix deflexo. Pedes 8 postici ad basin infra uni-spinigeri; 5ti 4tis parce minores, tarso lamellato, versus apicem elongatè setigero.
- G. 5. *TRIBOLA*, *Dana*.—Carapax fronte horizontalis, tricuspidatus, rostro (vel cuspidè medianâ) cuspidibus externis vix longiore et supra sulcato. Antennæ internæ inter rostrum et cuspidès externas apertè inflexæ. Pedes duo postici minores, tarso styliformi, setis longis non instructo.

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GENUS *MARESTIA*, *Dana*.

THE genus *Marestia* includes *Monolepis spinitarsus* of *Say*. The distinction, in the aspect of the species, between this genus and *Monolepis* is very striking. The carapax is nearly flat above, and much less thick or obese. The sternal fossa is deep, with slender trenchant borders, in *Monolepis*, while in *Marestia*, it is much less deep, and the borders are rounded, or more gradually flaring. The depression on the surface of the carapax for the posterior legs is another point of distinction; moreover, the tarsi are depressed and unarmed in *Mono-*



lepis, while in *Marestia*, they are compressed and armed with a series of spines, which are prolongations of the shell, and not mere setæ; and there is a striking uniformity in these spines, the third from the last or outermost, being the longest, and the next either side, smaller than the last. It is this uniformity which leads us to place this peculiarity among the generic characters.

The *Megalopa mutica* of Desmarest is not a true *Megalopa*, and may belong to this genus. The fact that the posterior legs have not been seen to overlie the carapax in that species, is not of much weight, since the specimens when taken do not often have them in this position; the author had often had different species under examination, before he discovered that the individuals were capable of this mode of arranging the legs. There is nothing in the structure of the legs that suggests this habit; for if seen extended, as they usually are, they appear like the other legs, in all their characters, excepting the long setæ at the extremity, which commonly are rather longer than the tarsus. De Haan describes the "*Megalopa mutica*" as found by him in Japan,\* and also at the Cape of Good Hope, and it is quite probable that the species was a *Marestia*, for no characters mentioned are at variance with this conclusion; possibly the *Marestia elegans*. But the absence of long setæ on the posterior tarsi, in the different figures of the *mutica*, does not allow us to pronounce on an identity, while De Haan says, "Specimina Japonica omnino cum Gallicis convenire videntur," at the same time citing the published figures. If not a *Marestia*, the *M. mutica* is the type of another genus.

#### MARESTIA ELEGANS.

*Carapax antice angustus et superne visus bilobatus, pone oculos vix saliens, lateribus fere parallelis. Pedes antici parvi, manu oblongâ, margine inferiore et superficie internâ remote hirsutis. Pedes 2di marginibus sparsim ciliati, tarso infra 7-spinoso, ad basin tuberculum infra non gerente. Pedes duo postici paulo breviores, tarso infra 6-spinoso, apice unguiculato et 4 setis longis instructo.*

Carapax anteriorly narrow, and as seen from above bilobate, margin behind the eyes hardly salient, sides nearly parallel and abrupt.

\* Faun. Japon. Crust., 166.

Anterior feet rather small, hand oblong, with a few remote ciliæ on lower side. Feet of second pair sparsely ciliate along the margins, tarsus below with seven spines, and without a tubercle at base. Posterior feet shorter, tarsus with six spines below, apex unguiculate and furnished also with four longish setæ.

Plate 31, fig. 2 *a*, animal, enlarged four diameters; *b*, front view of front; *c*, outer antennæ; *d*, second maxilliped; *e*, third or outer maxilliped; *f*, hand; *g*, same, with fingers closed; *h*, tarsus of third pair of legs; *i*, tarsus of fifth pair.

Off Cape of Good Hope, abundant.

Length of carapax, four to five lines. Carapax, translucent and smoky brown within; surface, spotted with bright blue, and legs the same; abdominal segments, brown, with a row of largish blue spots near posterior margin; last segment, colourless; eyes, blue-black within, with a greenish reflection. Arm and carpus unarmed.

Krauss mentions that the *Megalopa mutica* was found by him at the Cape of Good Hope; and we have suspected that the above may be the species he obtained. The *mutica* is figured by Desmarest without the setæ of the posterior tarsi, and more recently in the same manner by Edwards, in Cuvier's Animal Kingdom; and moreover, it has the lobes of the front more projecting. It differs from the *spini-tarsus* of Say, in having four instead of three terminal setæ to the posterior tarsi, and from the *atlantica*, in having the posterior tarsi spinous below, like the preceding,—in the number of setæ, being four instead of three,—and the spines of the other tarsi, seven in number, without a basal tubercle.

#### MARESTIA ATLANTICA.

*Carapax antice angustus et superne visus bilobatus, pone oculos vix saliens, lateribus postice parce divergentibus. Pedes antici parvi, manu oblongâ, nudâ aut nudiusculâ. Pedes 6 sequentes nulliusculi, tarso infra 5-spinoso, ad basin tuberculum instar calcis infra gerente. Pedes postici minores, tarso parvulo, infra non spinoso sed setularum brevium paribus duabus instructo, apice unguiculato et setis tribus armato.*



Carapax anteriorly narrow, and, as seen from above, rather strongly bilobate, behind the eyes hardly salient, sides posteriorly somewhat divergent. Anterior feet small, hand oblong, naked or nearly so. Six following legs naked or nearly so. Tarsus with five spines and a seta, and at base a tubercle like a heel to the tarsus; posterior pair smaller, tarsus small, not spinous below, but having two pairs of short setules or hairs, at apex unguiculate and armed with three long setæ.

Plate 31, fig. 3 *a*, animal, enlarged four diameters; *b*, outer antennæ, enlarged; *c*, tarsus of third pair; *d*, ibid, of fifth pair; *e*, part of one of the setæ of posterior tarsus; *f*, hand; *g*, front view of beak.

Atlantic, lat.,  $8\frac{1}{2}^{\circ}$  south; long.,  $26^{\circ}$  west. Collected on the 9th of November, 1838, at 4 A. M.

Length of carapax, three lines. Body, nearly transparent; faint reddish colour in the legs, and finely dotted with brown. The carapax is narrow in front, with the margin a little sinuous posterior to the eyes. The hand is smooth, quite broad and compressed, the part anterior to the fingers being hardly as long as its height. The carpus has a spine on the inner margin. Of the setæ at the extremity of the posterior tarsi, two are in part serrate, as in figure 3 *e*, while the other is simply setulose. The tarsi of the second, third, and fourth pairs of legs, instead of having seven spines below, like the *elegans* or *spinitarsus*, have a tubercle at base, in place of the first spine, and a seta in place of the second. The spines, as stated, are prolongations of the shell, and thus differ widely from hairs or setæ. Caudal appendages reach a little beyond extremity of abdomen; plates oval and edged with plumose hairs.

#### MARESTIA PERVALIDA.

*Carapax antice latus, et superne visus obsolete quadrilobatus, lobis subæquis, lateribus postice non divergentibus, propeque medium unidentatis. Pedes antici pervalidi, manu crassâ, tumidâ. Tarsi postici infra spinosi, apice setis tribus instructi.*

Carapax anteriorly broad, and as seen in a vertical view obsoletely

four-lobed, the lobes subequal ; sides posteriorly not diverging, near middle a single tooth. Anterior feet very stout, hand large and tumid. Posterior tarsi spinous below, and having three setæ at tip.

Plate 31, fig. 4, animal, enlarged eight diameters.

Pacific Ocean, six miles from Hall's Island, one of the Kingsmill Group. Collected one specimen at 4 A. M., April 14, 1841.

Length, two lines. Colour, strawberry-red ; legs, same colour, but paler ; antennæ, not coloured. Front a little narrower than the posterior margin, and nearly straight. Body and legs short hairy. The very stout hands and the tooth on the side of the carapax, as well as its general form, give this species a peculiar aspect. It has, however, the outer antennæ and posterior tarsi of the other species. The carapax is truncate behind, and rather narrower there than directly behind the eyes.

#### GENUS MONOLEPIS, Say.

We have seen specimens of but two species of this genus, that of Say, the *M. inermis*, and another from the East Indies, collected by the author. These agree in many points.

The carapax is broadest behind, and narrows gradually forward, and in front, its width between the eyes is about half the width posteriorly. The form is very obese, and nearly straight in front. The beak is flexed downward and a little backward, and its surface is but faintly sulcate at middle ; the extremity is tricuspidate, the medial point nearly an equilateral triangle, the others much shorter and hardly acute. The sides are high and vertical, and are impressed obliquely for the second, third, and fourth pairs of legs ; while each leg of the fifth pair when folded up, lies in a rather abrupt fossa upon the latero-posterior surface of the carapax. The upper surface of the carapax, in each species, has the outline and most of the markings in fig. 5 *b*. The eyes are large and somewhat oblique. Between the buccal area and the sternal fossa there is a prominence, with the surface around depressed. The sternal plates project in a subacute edge, as a border to the sternal fossa. The orbit is large ; but the eyes are not retractile ; there is a break in the margin below, where the base of the



outer antennæ stands. The inner antennæ have a globular base. Posterior to the orbit, there is an abrupt tuberculiform projection, which is not seen in an upper view, and not below, without removing, or moving to one side, the anterior legs. The abdomen has a very short penult joint; and the last or caudal segment is nearly semicircular; the caudal lamellæ are single either side and long ciliate. The hand is somewhat gibbous above, with the fingers rather more than half the whole length. The tarsi are depressed styliform, and are edged along either margin with a few short setæ or hairs.

The species are nearly identical in all their characters.

#### MONOLEPIS ORIENTALIS.

*Sterni segmenta fossam sterni includentia anterior margine interiore fere truncata; segmenta proxima parce convexa, non tuberculigera. Tuberculus medianus inter aream buccalem et fossam sterni simplex, subtriangulatus antice acutus, postice hemisphericus. Tarsus pedum 5torum styliformis, apice 3 setis tarso longioribus armatis, infra 4 setulis perbrevis.*

The first of the sternal pieces bordering the sternal fossa truncate at inner margin, this and the following without tubercles. The median sternal tubercle between the buccal area and the sternal fossa triangular, with the triangle pointing forward and rounded behind. Posterior feet having the tarsus short, not unguiculate, having three long setæ at apex, and below, four very short hairs, but no spines.

Plate 31, fig. 5 *a*, animal, enlarged four diameters; *b*, carapax; *c*, under view; *d*, front view of front; *e*, outer maxilliped; *f*, extremity of second pair in profile; *g*, extremity of fifth pair.

Sooloo Sea. Collected, Feb. 3, 1842.

Length of carapax, four lines. Body obese, and much convex. The depression of the carapax for receiving the posterior legs, abrupt and deep, with the margin prominent. Surface of the carapax in its anterior half, with seven punctures forming an arc convex forward, also, more posteriorly, two punctures and a reticulate structure; in

the posterior half, near posterior margin, a transverse depression. The long setæ of the posterior tarsi are nearly twice as long as the tarsi. The other tarsi are depressed, and sparsely fringed on the margin with short hairs; those of the anterior margin as long as the diameter of the tarsus, and those of the posterior, about half this length.

This species is exceedingly near the *Monolepis inermis*. In that species, however (see fig. 6, Plate 31), the anterior pieces of the sternum (*s*) bordering the sternal fossa have the inner margin triangulate, and the following piece either side (*t*) has a prominent tubercle on the surface. Moreover, the small prominence (*r*), at the middle of the sternum, between the buccal area and the sternal fossa, consists of three subordinate tubercles, two more anterior than the other. In the figure referred to, *b*, is the buccal area in outline, the parts within being omitted; *p*, the prominence either side behind the orbits, not seen in an upper view.

#### GENUS CYLLENE, *Dana*.

*Carapax fronte simplicissime rostratus, rostro vix deflexo. Pedes 8 postici ad basin infra uni-spinigeri. Pedes 5ti 4tis parce minores, depressione carapacis ad eos recipiendos parce concavâ, tarso lamellato, versus apicem elongatè setigero.*

Carapax with a simple beak in front, and beak hardly deflected. Eight posterior feet at base below armed with a short spine, tarsi unarmed. Feet of fifth pair a little shorter than the preceding; the depression of the carapax for receiving the legs slightly concave; tarsus lamellar, long setigerous towards apex.

This genus is very close to Leach's *Megalopa*, but is peculiar in the lamellar posterior tarsi.

#### CYLLENE HYALINA.

*Rostrum parce prominens. Carapax subovatus, pone oculos marginibus paulo saliens, postice inermis. Cephalothorax infra postice inermis.*



*Pedes antici mediocres, carpo inermi, manu paulo tumidâ, supra gibbosâ, digitis hiantibus, apice inflexis, acutis. Pedes 2di 3tii 4tique subœqui, tarsis fere rectis, longis, articulo penultimo longioribus.*

Beak but little prominent. Carapax subovate, with the margin behind the eyes somewhat salient, posteriorly unarmed. Cephalothorax behind unarmed below. Anterior feet of medium size, carpus unarmed, hand somewhat tumid, fingers gaping, tips inflexed and acute. Feet of second, third, and fourth pairs subequal, tarsi long and nearly straight, longer than penult joint.

Plate 31, fig. 7 *a*, animal, enlarged four diameters; *b*, outer maxillipeds; *c*, hand; *d*, tarsus of third pair; *e*, tarsus of fifth pair; *f*, outer antennæ.

Atlantic, in open sea, off Rio Negro, Northern Patagonia, January 22 and 23, 1839; also, off Valparaiso, May, 1840.

Length of carapax, three to four lines. Colourless and hyaline, with one or two green spots in the joints of the legs. Eyes, black but with bright blue reflections. Second pair of legs longer than the following; tarsus edged with very short hairs. Last segment of abdomen at extremity truncated, sides rounded.

#### CYLLENE FURCIGER.

*Rostrum elongatum, spiniforme, frontis latitudine non brevior. Cephalothorax ad extremitatem posteriorem spinis duabus longis divergentibus infra armatus. Pedes anticiangusti, carpo articuloque 2do spinâ curvatâ armatis, brachio inermi. Tarsi 2di 3tii 4tique parce arcuati, styliformes.*

Beak long and spiniform, longer than breadth of front. Cephalothorax below and behind armed with two large and long divergent spines. Anterior feet narrow, carpus and second joint armed with a short curved spine, arm unarmed. Tarsi of second, third, or fourth pair very sparingly arcuated, styliform.

Plate 31, fig. 8 *a*, beak and front; *b*, two divergent spines of pos-

terior part of cephalothorax below; *c*, anterior leg; *d*, posterior tarsus.

Sooloo Sea.

Length of carapax, one and a half lines. The long spines at the posterior part of the thorax below start from the medial line, and are widely divergent, being seen projecting either side of the base of the abdomen. The tarsus of the posterior pair of legs is rather narrower than in the *hyalina*. The upper margin of the carapax behind is not armed. The hand is oblong, and not much inflated.

GENUS TRIBOLA, Dana.

*Carapax fronte fere horizontalis, tricuspidatus, rostro (vel cuspidè medianâ) cuspidibus externis vix longiore et supra sulcato. Antennæ internæ inter rostrum et cuspidès externas aperte inflexæ. Pedes postici parce minores, tarsi styliiformi infra armato, setis longis non instructo.*

Carapax in front nearly horizontal, tricuspidate; beak (or middle cusp) hardly longer than the cusps either side, and sulcate above. Inner antennæ, when flexed, exposed in the interval between the beak and the cusps adjoining. Posterior feet little smaller, tarsus styliiform and armed with spines below, not furnished with long setæ.

TRIBOLA LATA.

*Carapax latè ovatus, paulo longior quam latus, rostro et cuspidibus externis fere remotis, his apice acutis et paulo divaricatis, marginibus pone oculos parce undulatis. Pedes antici tenues, manu pedibus sequentibus vix crassiore.*

Carapax broad ovate, a little longer than broad, intervals either side of beak quite broad (nearly as broad as long); lateral cusps acute, a little divaricate at apex. Margin behind eyes a little undulate. Anterior feet slender, hand hardly stouter than the following legs.



Plate 31, fig. 9, animal, enlarged.

From the stomach of a Bonito, taken in the Atlantic, off the Canaries, lat., 27° north, long., 19° west, Sept. 27, 1838.

Length, nearly half an inch. Beak straight, not apiculate at apex, but appearing emarginate, the emargination corresponding to the channel above. Carapax behind deeply concave. The hand of first pair of legs not larger in diameter than the carpus or arm. Third pair of legs longest. Last joint of eight posterior legs sharply spinous below. Abdomen oblong-oval. Caudal appendages oblong-elliptical, provided with long plumose setæ.

#### TRIBOLA PUBESCENS.

*Carapax pubescens, oblongus, subovatus, pone oculos undulatus, rostro lineari, marginibus obsolete denticulato, spatiis inter rostrum et cuspides externas angustis. Pedes antici rostrum paulo superantes, angusti, manu dextrâ non latiore quam carpus, octo sequentes fere duplo longiores, secundi tertiis breviores.*

Carapax pubescent, oblong, subovate, undulate behind the eyes, beak narrow linear, margins obsolete denticulate, spaces either side quite narrow. Anterior feet extending a little beyond apex of beak, narrow, rough linear, not stouter than preceding part; eight following feet nearly twice as long as anterior pair, second pair shorter than third.

Plate 31, fig. 10 *a*, animal, enlarged; *b*, beak; *c*, left hand.

Pacific, at Carlshoff and Peacock Islands, in the Paumotus. Collected September, 1839, in shallow waters along shores, often under stones.

Length, between two and three lines; ratio of length to breadth of carapax, as 1.4 : 1. Colourless; transparent. The linear beak has a

rounded prominence at apex, which is abruptly narrower than the preceding part. Carapax concave behind, with posterior angles rounded; a rounded prominence on the margin posterior to eyes, just anterior to base of first pair of feet. The fifth pair of legs is the shortest, the second next shortest. The last joint is oblong (half as long as preceding), and spinous beneath, with six or seven stout spines, of which the second from apex is stoutest; also one spine near apex on outer margin. There is a spine directed upward on the base of the inner antennæ, as it lies folded adjoining the beak. Whole body—the carapax, abdomen, exterior maxillipeds, and legs—pubescent with very short hairs. Exterior maxillipeds not in contact; third joint much smaller than second.

The species may be the young of a *Plagusia*.

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### TRIBE III. MACROURA.

BEFORE considering the classification of the *Macroura*, we must again bring into view the prominent characteristics distinguishing the typical forms among them, from those of the *Brachyura*. These characteristics are not equally pronounced in all the *Macroura*. There are variations of development or condition, and these variations mark the greater or less affiliation of the species to the *Brachyural*, or *Macroural* type. The same organs and the same range of characters, therefore, which separate the grander divisions of *Decapods* or *Eubranchiates*, are generally of pre-eminent importance in tracing out the minor groupings, and their value in the former case is to a certain extent, a criterion of their value in the latter. We must, therefore, have these characteristics in mind, as the first and most essential step towards a correct appreciation of the natural distinctions and arrangement of the species. The attention of the reader is therefore again directed to these characteristics, as detailed on page 49 of this volume.

There are also relations to the *Anomobranchiates*, or the *Squilla*



and Mysis groups, a grade of species inferior to the Macrourea. The following are the only points in these distinctions which it is necessary now to consider. In the Macroureal *type*:—

A. The branchiæ are thoracic, and are covered by the carapax [instead of being uncovered, and sometimes attached to the abdominal appendages, or wholly wanting, as in the Anomobranchiates].

B. The abdomen is either shorter or but little longer than the thorax [instead of being very much longer, as in *Squilla*].

C. The legs are simple [instead of being two-branched].

We may now apply these distinctive characters in deducing the natural subdivisions of the Macrourea.

*a.* A free extended abdomen, with pairs of natatory appendages below, and caudal appendages behind; inner antennæ without fosses, and vulvæ in the base of the third pair of legs, characterize all the Macrourea without exception.

*b.* The lateral suture of the carapax, strongly marked in the Brachyura, is almost wholly confined to Brachyural species, and to the few Anomoural. De Haan makes the absence of this suture an invariable law for the Macrourea, and, as has been stated, he has transferred the Galatheidea from the Macrourea to the Anomoura, on this ground. But there are still a few true Macroureal species which have this peculiarity; these are the THALASSINIDEA or digging Macrourea, and they are thus widely separated from the other groups. But few of the species fail of it.

*c.* The bending of the carapax either side to form the under surface of the cephalothorax and its union to the epistome, is one of the most striking features of the Brachyura. But, while in most Macrourea the sides are free, there are a few species which approximate to the Brachyura in this respect. This is prominently seen in *Scyllarus*, *Eryon*, *Palinurus*; also, less distinctly in *Astacus* and *Nephrops*, genera that link the preceding to the more typical Macrourea. We observe, therefore, that here is a natural line of division among the Macrourea, marking off a group of *superior* grade—the ASTACIDEA. The importance of this distinction is brought out by De Haan.

*d.* The *absence* of a scale from the base of the outer antennæ, is, without exception, characteristic of the Brachyura; while its *presence* marks the typical Macrourea. The few Macrourea in which the scale is wanting, hence, bear evidence in this of their higher grade. They

pertain either to the group Astacidea, already pointed out as of superior rank among Macroura, or to the Thalassinidea, a group ranging towards the same high rank in some of its characteristics, as shown in the longitudinal sutures of the carapax. Throughout both these groups, the scale is either wholly absent, or of comparatively small size.

*e.* Operculiform outer maxillipeds are seldom to be found among the Macroura. They occur in a genus of Thalassinidea—*Callianassa*; also in the genus *Gnathophyllum* among the Caridea, and less perfectly in *Pontonia*. In either case the approximation is but slight to the true Brachyural form, in which these organs are not only lamellar, but are fitted neatly to the epistome and lateral margins of the buccal area.

In this review we have indicated the separation of two groups from the other Macroura, namely, the Thalassinidea and Astacidea. They approach, as shown, most nearly to the Brachyura. It remains to consider, whether the remaining species constitute a single group or more than one. The principle upon which we look for a farther subdivision, rests still on a divergence from the Brachyural structure, that is, an inferior state of concentration in the nervous system as indicated in the structure of the species.

There is no peculiarity of the Brachyura more striking and more uniform than that of the position of the strong chelate legs. They are invariably the anterior pair. This, therefore, is one of the marks of that superior force which belongs to the anterior part of the cephalothorax, that is, of that more highly organized nervous system, which gives to the anterior part of the body its superior or subcephalic character. Among the Macroura, the diffusion of the forces is apparent not only in the largely developed abdomen, the presence of natatory abdominal appendages, the prolonged thorax, and elongated antennæ without fossettes, and eyes without orbits; it is also seen in the backward transfer of power among the legs. The anterior pair retain their supremacy in the Astaci and Thalassinidea, although we find a following pair, or two, sometimes small chelate. Among the other Macroura, the same fact is observed, as, for instance, in *Alpheus*; but often, as in *Palæmon* and others, the second pair is the larger and more powerful pair. These two classes of species—those with the first pair strongest, and those with the second pair so—are so



related in other characters, that no line of demarcation can properly be drawn between them. It appears to be upon this level, admitting of a vibration of force between these two pairs, that the numerous modifications occur among the typical Macroura; for, while the larger second pair, in certain genera, might imply a lower grade, other characters come in as a counterpart to raise the type to a level with those species having the first pair largest, and the gradations from the one to the other are by insensible shades. There is, therefore, no natural subdivision based on this difference of structure.

But this backward transfer of force, or diffusion among the posterior ganglia, takes also another step among the Macroura, so that in certain species, the cephalic part of the body is still less of a head than in those before referred to. The power of the arms, instead of resting between the first and second pairs of thoracic legs, passes to a pair still more posterior, the third pair; and this third pair is not feebly chelate—a fact true of the same legs in *Astacus*,—but it is the strongest and longest pair, to which the two anterior are subsidiary and not in any sense superior. This is the case in the *Penæi*. This characteristic may, therefore, serve to divide the Macroura, exclusive of the Astacidea and Thalassinidea, into two groups, the CARIDEA and PENÆIDEA.

There are species still lower (*Acetes* and the allied), in which all the legs have the feebleness of those in *Mysis*; even the third pair is not chelate, or only obsoletely so. The anterior legs have no higher value or functions than the posterior. These are properly the lowest of the Macroura, and constitute a division of the Penæidea. Some of them have even one or two posterior pairs of thoracic legs wanting, as in some of the *Mysis* group, and in the *Entomōstraca*.

On these grounds, we institute four grand divisions of the Macroura. We leave it for others to decide whether or not the Thalassinidea should be divided into a higher and lower group, equivalent to the other groups here adopted, on the ground of the branchiæ being solely thoracic or partly abdominal appendages; if so, the number of groups would be *five*, three in the *typical* line, and two in the *aberrant*.

The four groups may be characterized as follows:—

- I. THALASSINIDEA.—Carapax duabus suturis longitudinalibus subdivisus, sæpeque suturâ dorsali transversâ. Antennæ externæ squamâ basali nullâ vel parvâ instructæ. Pedes 6 postici directione non consimiles; antici longiores et crassiores, fossorii et sæpius chelati.

II. ASTACIDEA.—Carapax suturâ dorsali transversâ sæpe notatus, suturis longitudinalibus obsoletis, testâ antero-laterali cum epistomate connatâ. Antennæ externæ squamâ basali sive nullâ sive parvâ instructæ. Pedes 6 postici directione fere consimiles; antici crassiores, sive didactyli sive monodactyli. [Branchiæ penicillatæ.]

III. CARIDEA.—Carapax suturâ nullâ notatus, epistomate antice non connatus. Antennæ externæ squamâ basali grandi instructæ. Pedes 6 postici directione fere consimiles, 1mi vel 2di crassiores et chelati, 3tii 4tis similes. [Branchiæ foliosæ.]

IV. PENÆIDEA.—Carapax suturâ nullâ notatus, epistomate antice non connatus. Antennæ externæ squamâ basali grandi instructæ. Pedes 1mi 2dique 3tiis non crassiores, 3tii sæpius crassiores longiores et chelati; raro pedes toti debiles et tenues, 3tiis sive obsoletè chelatis sive omnino vergiformibus.

The Thalassinidea are related on one side with the Paguri, which they approach in the carapax, in the legs in part, and at times in the form of the head and the base of the outer antennæ (as in *Gebia* especially); and, on the other side, they have affinities with the Squillidæ. The line of gradation which they occupy between the Anomoura and Anomobranchiates, is wholly separate from that occupied by other Macroura. This section, therefore, is distinct in its range, and cannot properly fall into the section Astacidea, where it is placed by De Haan.

The Astacidea, Caridea, and Penæidea, viewed as a whole, constitute together a second line, between the higher Decapods and the Anomobranchiates, ranging towards the Mysidæ. The first is the highest group of the three, and is partly Brachyural in its characteristics. It is not, however, especially related in any points to the Anomoura; and we therefore view this line, not as a line of gradation from the Anomoura down, but rather, that in which the Macroura reach upward to their more exalted forms. The *Astacidea* are therefore the MACROURA SUPERIORA, while the *Caridea* are the MACROURA TYPICA, and the *Penæidea* are the MACROURA INFERIORA. In the same manner we might designate the *Thalassinidea*, descriptively, as the MACROURA PAGURO-SQUILLIDICA.



The Astaci are widely separated from the Scyllari and Palinuri, by Milne Edwards, on the ground of their having a basal scale to the outer antennæ, while the others have none. But this distinction is not allowed by him to lead to a subdivision of the Thalassinidea, which it should do, if so important. De Haan makes the same separation, although he rejects the character derived from the basal scale of the antennæ, and rests his distinction on the union of the sides of the carapax to the epistome, which in the Astaci is less perfect, or by a suture. But De Haan, as stated, groups with the Astaci the Thalassinidea, a widely divergent group, many species of which show no trace of this union of the carapax to the epistome, any more than Palæmon and Penæus. The Astaci form the transition between the other Astacidea and the Caridea; and it does not seem desirable or proper to make a separate division to include alone these transition species.

We have already remarked, in the course of our observations on the Anomoura, respecting the propriety of separating the Galatheidea and Ægleidea from the Macroura. Should these groups still be retained among the Macroura, they would form together a section, Anomoural in affiliation, having the posterior thoracic leg, short and inflexed alongside of or beneath the carapax; the former constituting one family in the section, having the branchiæ made up of serial leaflets, and the latter, another family, having the branchiæ made up of clusters of filaments.

There is a singular group of Crustacea, which has been referred to the Macroura, that includes the genus Cuma, and some others allied.

These animals have many marks of degradation, or rather, of immaturity. The branchiæ are reduced to a single pair; the eyes are covered by the carapax, and hardly moveable; the abdominal appendages are generally obsolete, and the caudal pair is styliform; the carapax is short, leaving three posterior segments of the thorax as distinct segments or rings, very much as in Cyclops. If actually mature, they should constitute another division of the Macroura—the Cumidea, *Entomostracic* in type. But, according to recent observations by Professor Agassiz, communicated by him to the author, the Cumæ are in part, if not always, the young or immature forms of certain Macroura, as Alpheus, Palæmon, and Hippolyte. This distinguished observer has actually obtained Cumæ from the eggs of *Crangon septemspinus*, *Palæmon vulgaris*, and *Hippolyte aculeata*.

## SUBTRIBE I. THALASSINIDEA.

THE group Thalassinidea is remarkable for the wide limits in rank covered by the species. As has been observed, they fill up an interval between the Anomoura and Squillidea, forming an almost complete line; independent of the other Macroura; they inosculate with the latter (particularly with the Astacidæ) in a few species only, without entering into a common series with them. There is great diversity in the legs, the branchiæ, the maxillipeds, and more remarkably still, in the carapax, and the abdomen with its appendages. We dwell here upon the peculiarities of the carapax alone, as the other points have been more fully developed by other authors.

In some species, as those of the genus Gebia, the head has an unusual vertical height, as seen in a profile view; the outer antennæ are placed low and the base is in view, very much as in Cenobita; indeed, a comparison brings out a very close similarity to that genus in the position of these parts. In others, as Callianassa and Thalassinina, the outer antennæ have a much higher position, being nearer the beak; and the base is covered by the expanded side of the carapax. In this, we have a resemblance to the genus Pagurus, which differs in this way from Cenobita. The figures on Plate 32 exhibit well these peculiarities.

The subdivision of the carapax by sutures, is strikingly diverse in different genera, although conformed to a single system. There is commonly a transverse *dorsal suture*, and either side of the dorsal portion of the carapax, a *longitudinal suture*, more or less distinct. The transverse suture passes either side into the dorsal, and partly or wholly follows it to the anterior margin of the carapax. The two sets of sutures together, hence divide the carapax into four parts or areas, a dorsal anterior, a dorsal posterior, and two lateral.

Let us now examine into the forms of these areas, and the subdivisions they undergo.

The longitudinal suture either side commences at the base of the outer antennæ, and extends to the back margin of the shell; the position of the base of the antennæ will therefore modify somewhat the direction of the longitudinal sutures. In Gebia, where the insertion of these antennæ is at an unusually low level, this suture as-



cends obliquely on leaving the front margin; while in *Callianassa* it is nearly horizontal. Hence, in a side profile view of the antero-dorsal portion of *Gebia*, its form is triangular, being highest at middle; while in *Callianassa*, the height is small and nearly equal throughout. At first sight, it seems as if the oblique suture of *Gebia* is wanting; but on consideration, it appears evident, that it only has a different position, and in each there is the same termination of the suture near the base of the outer antennæ. The same difference exists between *Cenobita* and *Pagurus*.

The sutures, thus far alluded to, are all that exist in *Callianassa*. But in other genera there are additional sutures, subdividing either the lateral pieces, or the postero-dorsal, or both. In *Gebia* and *Thalassina* there is a strong suture, sometimes the strongest or most open in the carapax, dividing vertically with a curve the lateral pieces into an *anterior* and a *posterior* portion. In *Thalassina*, this suture descends from near the transverse dorsal suture; in *Gebia*, it has a more posterior position, a large interval separating it from this dorsal suture; its direction is also more oblique, bending more forward, as it descends with a curve towards the lower margin, which it hardly reaches (see Plate 32). In *Thalassina*, this suture is very open, except at a single point of coalescence, and the edge of the posterior portion is dentate or denticulate; although so apparent, it is lost before reaching the lower margin. The point which it would reach if extended is normally very near the same as in *Gebia*.

This suture hence divides the lateral pieces into an antero-lateral and postero-lateral; the antero-lateral is oblique from above downward and forward in *Gebia*, and from above downward and backward in *Thalassina*.

The antero-lateral piece is not farther subdivided in *Thalassina*, or not distinctly so. But in *Gebia*, it is crossed often by a horizontal suture, a little oblique, which divides it into a lower and upper (or marginal and inner) portion. This suture is seen in the lateral view of *Gebia hirtifrons* (pl. 32, fig. 2).

The postero-dorsal piece is broad, and without any subdivisions in all the genera excepting *Thalassina*. In this genus its form is narrow, becoming narrower behind and terminating in a point. Moreover in its posterior part it is crossed by two or three sutures looking something like obsolete articulations. A corresponding suture sometimes occurs for a short distance in the lateral piece adjoining, as seen in

the figure of *Thalassina gracilis*, as if a transverse articulation marked the lateral pieces as well as the medial. In the species referred to, there are two quite distinct sutures on the dorsal piece, and another, anterior to these, more faint, appearing to divide this piece into four segments.

Such are some of the diversities of structure in the carapax of the Thalassinidea. The genera *Axius*, *Calocaris*, and *Laomedia*, differ little in these respects from *Gebia*. In *Axius stirhynchus*, there are only faint traces of the dorsal longitudinal sutures, nearly as in *As-tacus*.

In studying out the homologies of these sutures and the areas they bound, we may first compare the species with the structure in *Pagurus* and *Æglea*, and we would therefore refer again to Plate 28, fig. 4, and Plate 32, figs. 1, 5. A general resemblance is at once apparent. In figures 1 *a* and 1 *b* of the *Gebia pugettensis*, and 5 *a*, 5 *b* of *Thalassina gracilis*, the transverse dorsal suture (*d*) is similar to that of *Pagurus* and *Æglea*; it bends forward on either side to the base of the outer antennæ. The longitudinal dorsal sutures (*p*) are also similar, and either correspond to *p* or *l*. In *Gebia*, the suture *n* is distinct, and the piece *S* of *Pagurus* and *Æglea*, with the space below, has its analogue. In *Thalassina*, the suture *n* is also distinct, though losing itself below, as in *Pagurus*, and the position of it differs from *Gebia*, only in resembling *Pagurus* more closely, although the area *S* is not distinct. It is hence obvious that the structure of the carapax in the Thalassinidea is essentially the same as in *Pagurus* and *Æglea*.

With regard to the relations of these portions of the carapax, or of the sutures separating them, to the Brachyural structure or the normal series of segments, we offer the following considerations, in addition to those presented on page 32 and the following. The portion of the carapax pertaining to the second antennary segment must be the anterior dorsal portion, if the distinction exists. This part covers or encloses the antennary portion of the front, and is circumscribed by a strong suture. It seems, therefore, to be normally this segment and the whole of it. If the rest of the carapax is to be considered the epimeral portion of this segment, what are we to say of its dividing sutures? for they seem to show that this posterior part contains a medial and two epimeral pieces of its own, as if normally an independent segment. Again, the antero-lateral piece in *Gebia* passes with a broad surface into the postero-dorsal, a long part of the longi-



tudinal suture separating them. In *Thalassina*, this union seems to be almost intercepted, yet there is a narrow connexion which is unbroken by a suture. In each, therefore, the antero-lateral piece and the posterò-dorsal (or, at least, its anterior part) have a mutual dependence; and the absence of a suture between in one case, and its indistinctness in the other, compared with the transverse dorsal suture, show that this dependence is of the closest kind, even that of parts of a common normal segment; moreover, the postero-lateral piece also is probably a part of the same. We may, therefore, conclude, that the anterior and posterior divisions of the carapax in the *Thalassinidea*, are normally distinct segments; and they correspond, the first to the second antennary normal segment, and the second to the mandibular.

This conclusion, in all its extent, should not be taken as universal for the *Macroura*, or even for the *Thalassinidea*. It has been shown among the *Entomostraca*, that, while the carapax has similar relations to those of the *Brachyura* in some genera, in others, closely allied as the *Cyclopacea*, it undergoes a subdivision into segments. And this subdivision depends partly on the connexion of the carapax with the thorax beneath. The whole carapax, as in *Cypris*, may normally pertain to one or two cephalic segments; again, some of the posterior of the thoracic segments, as in *Cyclops*, may so unite in constituting it, or as it were come to the surface dorsally, that the articulations of these segments become apparent. This last fact may afford the true explanation of the transverse sutures in the postero-dorsal piece in *Thalassina*. The normal segments below, here seem actually to contribute to the carapax; and the sutures corresponding in the postero-lateral portion of the carapax appear to indicate the same articulations or segments, and properly their epimeral portions. The correspondence is so close between these posterior subdivisions and the articulations in the *Entomostraca*, referred to, that we cannot fail to see in both, exemplifications of a single general law. The *Thalassinidea*, however, afford us a good ground for a general conclusion with regard to the other *Macroura*. This is evident from the structure of the carapax in *Astacus*, a genus more closely related than any other to the *Thalassinidea*. There is in this genus a transverse dorsal suture, which is very distinct. But besides this, there are traces of the longitudinal sutures of the posterior part of the carapax, as shown in the figures, on Plate 33; and these sutures are separated sometimes by a narrow linear area, as in *Thalassina*, and sometimes by a broader area,

as in *Gebia* and *Callianassa*. The parts in the *Astaci* and *Thalassinidea* have, consequently, like relations.

In the *Macroura*, therefore, it is probable that the *anterior* part of the carapax corresponds generally to the second antennary normal segment, and the *posterior* and lateral to the mandibular segment, the lateral portions being epimeral to the segment last-mentioned. The *former* corresponds to the main body of the *Brachyural* carapax, the *latter*, to only its ventral pieces (epimerals of Edwards) separated from the rest by a longitudinal suture.

But before the difficulties of this subject are wholly cleared up, we must consider more particularly the actual relations between the longitudinal suture in the *Brachyura* generally, and those in *Æglea*, *Pagurus*, and the *Thalassinidea*. This suture of the *Brachyura* exists distinctly in *Galathea*, and is the only suture; and in this genus of *Anomura*, therefore, the carapax must have the same normal relations as in the *Brachyura*. In *Æglea*, a genus near *Galathea*, we find the *Brachyural* and *Macroural* sutures strangely combined; there is a lateral (*l*), the analogue of the *Brachyural*, and besides this, another longitudinal (*p*), nearer the middle of the back, and the latter is the more distinct. The same is shown also in *Pagurus*. Such transition peculiarities in these transition forms are of great interest, and at first thought, are perplexing to the mind. The next grade (represented among the *Thalassinidea* and very many *Paguridæ*) presents but one of these sutures, the other being obsolete; and from the much greater distinctness of the *inner*, in *Pagurus* and *Æglea*, we infer naturally, that it is the outer or true *Brachyural* suture that has become obsolete. This would also be inferred from the resemblance in the medial area between *Pagurus* and *Thalassinina*; the greater width of this area in *Gebia* does not seem to vitiate the conclusion; for we find both the broad and narrow form in the *Astaci*.

These facts might be thought to prove, that the suture in the *Brachyura*, as Milne Edwards has argued, is only an epimeral suture, inasmuch as the longitudinal suture corresponding, is so subordinate in the *Paguri* and related forms.\* But if we remember that these are only transition forms, and this is but the dying out of the *Brachyural* structure, as the species pass to the *Macroural* type, we shall not thus conclude. The suture *l* (corresponding to the *Brachyural*), is

\* With regard to the *Macroura*, M. Edwards supposes the posterior region epimeral to the anterior.



wholly absent, as stated, in most of the Paguridæ, and is but faintly seen in any of them; while the *transverse* suture becomes the grand suture of division in the Macroural carapax, being the most prominent, and the last to disappear as the species descend in rank.

From the remarks which have been made, it is clear that there are at least three distinct varieties of structure among the Thalassinidea, one illustrated by Gebia, one by Callianassa, and one by Thalassinia. There are other characters which point to these as three important subdivisions of this group. These subdivisions pertain to the section of the Thalassinidea having thoracic branchiæ alone. The other division, in which there are abdominal branchial appendages, contains but two genera. The following is, therefore, our classification of the Thalassinidea:

LEGIO I. THALASSINIDEA EUBRANCHIATA.

BRANCHIIS THORACICIS INSTRUCTA TANTUM.

Fam. I. GEBIDÆ.—Maxillipedes externi pediformes. Appendices caudales et aliæ abdominales latæ.

Fam. II. CALLIANASSIDÆ.—Maxillipedes externi operculiformes. Appendices caudales latæ.

Fam. III. THALASSINIDÆ.—Maxillipedes externi pediformes. Appendices caudales lineares.

LEGIO II. THALASSINIDEA ANOMBRANCHIATA.

PEDES ABDOMINIS APPENDICIBUS BRANCHIALIBUS INSTRUCTI.

The known genera of living species of Thalassinidea are as follows:—

## LEGIO I. THALASSINIDEA EUBRANCHIATA.

## FAM. I. GEBIDÆ.

- G. 1. *GEBIA*, *Leach*.—Digitus paris antici inferior obsolescens. Pedes 2di 3tii 4ti 5tique monodactyli. Rostrum tridentatum. Antennæ externæ squamâ basali carentes.
- G. 2. *AXIUS*, *Leach*.—Manus latæ, digito inferiore elongato. Pedes 2di minores, sublamellati, didactyli; 3tii 4ti 5tique monodactyli. Rostrum simplex, triangulatum. Oculi pigmento perfecti. Antennæ externæ squamâ basali parvâ instructæ.
- G. 3. *CALOCARIS*, *Bell*.—Manus graciles, digito inferiore elongato. Pedes 2di minores, cheliformes, 3tii 4ti 5tique monodactyli. Rostrum ac in *Axio*. Oculi pigmento corneâque carentes. Antennæ externæ squamâ basali parvâ instructæ. Segmentum caudale oblongum.
- G. 4. *LAOMEDIA*, *De Haan*.† Manus ac in *Axio*. Pedes 2di monodactyli, quoque 3tii et 4ti; 5ti obsoleti.
- G. 5. *GLAUCOTHOE*, *Edwards*.—Manus ac in *Axio*. Pedes 2di 3tiique pediformes ac in *Paguro*; 4ti 5tique subcheliformes. Antennarum internarum flagella articulo breviora precedente.

## FAM. II. CALLIANASSIDÆ.

- G. 1. *CALLIANASSA*, *Leach*.—Oculi sublamellati, corneâ medianâ et non marginali. Flagella antennarum internarum articulo precedente longiora. Pedes 1mi grandes, bene didactyli; 2di didactyli minores, 3tii articulo penultimo late lamellati.
- G. 2. *TRYPÆA*, *Dana*.—Pedibus *Callianassæ* affinis. Flagella antennarum internarum articulo breviora precedente, antennis subpediformibus.

## FAM. III. THALASSINIDÆ.

- G. 1. *THALASSINA*, *Latreille*.—Manus validæ, multo inæquæ, digito immobili manus majoris brevi. Pedes 2di articulo penultimo lamellati, 3tii 4ti 5tique angusti, monodactyli.

## LEGIO II. THALASSINIDEA ANOMOBRANCHIATA.

- G. I. *CALLIANIDEA*, *Edwards*.—Pedibus *Callianassæ* affinis, anticis bene didactylis, 2dis et 3tiis minoribus, didactylis, compressis, 4tis 5tisque subeylindricis. Oculi ac in *Callianassâ*.

\* British Crustacea, p. 231.

† Faun. Japon. Crust., p. 162.



G. 2. CALLISEA. — (Isæa, Guérin; Callianisea, Edwards.) Forsan a Callianideâ nihil differt, teste Edwardsio (Crust., ii. 321).

The name Isæa was changed by Edwards, on account of its previous use, to Callianisea, which, as this so closely resembles Callianassa and Callianidea, we would change again to Callisea.

## I. THALASSINIDEA EUBRANCHIATA.\*

### FAMILY I. GEBIDÆ.

#### GEBIA PUGETTENSIS.

*Frons tridentatus, dente mediano triangulatus, superficie supernâ usque ad suturam dorsî transversam scabrâ et hirsutâ. Manus marginibus pilosa, non spinulosa nec dentata, superficie externâ lævis non costata, lineâque densè hirsutâ longitudinaliter notata, digito inferiore dentiformi, crasso, acuto, non incurvato, digito mobili elongato, inermi, margine piloso. Pedes 2di infra longissimè ciliati. Antennæ externæ quoad basin partim pilosæ, flagellis paulo hirsutis. Segmentum caudale transversum, rectangulatum, integrum.*

Front tridentate, median tooth triangular, upper surface nearly to dorsal suture scabrous and hirsute. Hand pilose at the margins, but not spinulous nor dentate, outer surface smooth, not costate, having a hirsute or lanose longitudinal line just below the middle; tooth corresponding to lower finger stout, acutish, not incurved; moveable finger elongate, unarmed, pilose at margins. Second pair of feet having the lower side very long ciliate. Outer antennæ with the basal portion in part pilose, the flagellum somewhat hirsute. Caudal segment transverse rectangular, entire.

\* The following new species of Thalassinidea are described in brief by the author in the Proceedings of the Academy of Nat. Sci. of Philadelphia, for January, 1852.

Plate 32, fig. 1 *a*, animal, natural size; *b*, profile view of carapax, enlarged four diameters; *c*, hand, enlarged two diameters; *d*, caudal extremity.

Puget's Sound.—C. Pickering.

Length, two inches. The outer antennæ have at base the appearance of an appendicular scale, lying against the third basal joint; the form is narrow lanceolate, and its edge on both sides is long ciliate; but it appears to be only a part of the surface of the third joint, without separate motion. The carpus is short triangular, and has a spine at apex; also, a row of short spinules near its lower margin. The arm is not denticulate at the upper margin, which is naked, but has an even row of delicate teeth on the lower margin. The outer surface of the hand is convex; and besides having a lanose line below the middle, it has a line of distant short hairs above the middle, and the hairs of the lower part of this surface conceal entirely the lower finger in a view from the outer side.

#### GEBIA HIRTIFRONS (*White*).

Plate 32, fig. 2 *a*, animal, natural size; *b*, view of front, enlarged; *c*, side view of carapax, enlarged; *d*, hand; *e*, caudal segment; *f*, appendages either side.

Bay of Islands, New Zealand; found along shores, burrowing, like an Annelid, in the earth, among stones, near low water mark.

Length, two inches nearly. Colour, pale reddish. Scabrous surface of front part of carapax not reaching more than half way to dorsal suture, and the points mostly in six nearly longitudinal lines. Hand with the outer surface smooth, no spinules or denticulations, and few hairs on the upper margin; on lower margin, small denticulations, and rather hairy; lower finger slender and somewhat incurved; caudal segment not broader than long. Flagella of inner antennæ a little shorter than the last joint of base. Outer antennæ about as long as abdomen. A spine at lower apex of carpus.

*G. hirtifrons*, A. WHITE, Ann. and Mag. Nat. Hist. [2], i. 225; Voy. Erebus and Terror, pl. 3, f. 5.



## FAMILY II. CALLIANASSIDÆ.

## CALLIANASSA GIGAS.

*Frons paulo triangulatus. Manus major valde compressa, lævis, carpo non duplo longior, digitis brevibus, dimidio manus brevioribus, sparsim hirsutis, consimilibus, non hiantibus, superiore arcuato, acuto, brachio angusto, ad basin infra dentigero sed vix latiore, paululo longiore quam carpus, intus vix dentato. Segmentum caudale appendicibus caudalibus vix brevius.*

Front low triangular. Hand very much compressed, thin, smooth, not twice as long as carpus, fingers short, not half as long as hand, nearly similar in form, sparsely hirsute, not gaping, the upper arcuate and acute, not dentate within; arm narrow, below at base having a tooth, but not much broader there on this account, little longer than carpus. Caudal segment scarcely shorter than the appendages.

Plate 32, fig. 3 *a*, animal, natural size; *b*, eye, enlarged; *c*, arm; *d*, inner antennæ.

Puget's Sound.—Lieut. Case.

Length, four and a half inches. The outer antennæ are often thrown directly back along the carapax, by a flexure at the second and third articulations of the base. The longitudinal sutures of the carapax are very nearly straight. The posterior portion of the carapax is but little more than one-third the length of the anterior. The eye-peduncles are flat, and the eye is near the middle of the upper surface. The right of the anterior feet is the larger in our two specimens. The carpus is as broad as the hand; its length equals the length of the hand, exclusive of the fingers, and its breadth is about three-fourths the length of the arm.

## GENUS TRYPÆA, Dana.

*Callianassæ maxillipedibus externis pedibusque affinis. Antennæ internæ subpediformes, flagellis articulo basis ultimo brevioribus.*

Near Callianassa in outer maxillipeds and feet. Inner antennæ subpediform, flagella shorter than last basal joint.

The name of this genus is from *τρύπαια*, *I bore*, alluding to the burrowing habits of the species of Thalassinidea.

## TRYPÆA AUSTRALIENSIS.

*Frons non triangulatus. Pedes antici valde compressi, brachio carpo manique pedis majoris supra acutis. Manus major lata, lævis, carpo paululo longior; digitis fere dimidii manus longitudine, non hiantibus, intus subtiliter denticulatis, superiore paulo longiore, arcuato, carpo paulo minore quam manus, brachio cum processu cultriformi juxta basin infra armato. Segmentum caudale non longius quam latum, postice arcuatum.*

Front not triangular. Anterior feet much compressed, arm, carpus, and hand having an acute edge above. Larger hand broad, smooth, but little longer than carpus, fingers nearly half as long as hand, not gaping, finely denticulate within, superior finger a little the longer, arcuate, carpus somewhat smaller than hand, arm having a cultriform process below near base. Caudal segment about as long as broad, nearly rounded at apex.

Plate 32, fig. 4 *a*, animal, natural size; *b*, part of inner antennæ; *c*, part of outer maxillipeds.

District of Illawarra, New South Wales, along shores.

Length, two and three-fourths inches. Eyes on very short peduncles. Outer antennæ about half as long as body. Fingers with a



few short tufts of hairs. Lower as well as upper edge of hand, arm, and carpus, acute. Right hand the larger. We have not the specimen to verify the drawing, which we suspect may be wrong in the eyes.

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FAMILY III. THALASSINIDÆ.

THALASSINA GRACILIS.

*Carapax lævis, rostro perbrevis, acuto, margine extraorbitali acuto. Abdomen sparsim pubescens, marginibus integris, segmento caudali paulo oblongo, postice bene rotundato, non longiore quam appendices caudales. Pedes 1mi subæqui, valde compressi, manu angusto-elongatâ, margine superiore subacuto, breviter spinoso, inferiore integro et inermi, digito mobili paulo brevior quam pars manus anterior, angusto, fere recto, seriatim pubescente, digito immobili plus dimidio brevior, acuto. Pedes 6 postici tenues; 5ti paulo breviores.*

Carapax smooth; beak very short, acute, also an acute point just exterior to eyes. Abdomen sparsely pubescent, margins entire; caudal segment a little oblong, regularly rounded behind, not longer than the caudal appendages. Anterior feet subequal, much compressed; hand long and narrow, with upper margin trenchant, spinulous, and lower entire unarmed; finger a little shorter than part of hand anterior to it, narrow, nearly straight, seriatly pubescent; immoveable finger not half as long as moveable finger, acute. Six posterior feet slender, fifth pair a little the shortest.

Plate 32, fig. 5 *a*, animal, natural size; *b*, side view of carapax; *c*, beak, upper view; *d*, first pair of legs; *e*, second pair; *f*, part of exterior maxillipeds; *g*, caudal extremity.

From shores of Telegraph Island, near Singapore.

Length, two and a half inches. Eyes very small, projecting about half as far as beak. Base of second antennæ projecting but little

beyond beak, very slender; the flagellum reaching as far forward as the anterior legs. The large hand is longer than twice its width. Either side of the beak there is a slight ridge running longitudinally for a short distance from the front edge. The postero-lateral piece of the carapax has the anterior margin denticulate. The postero-dorsal piece is subacute behind, and has two distinct transverse sutures, besides another more anterior less distinct.

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SUBTRIBE II. ASTACIDEA.

THE division Astacidea is identical with the "Familia Macroura Astacina" of De Haan, in its extent and subdivisions, except that we exclude the Thalassinidea, which De Haan places in the same subdivision with *Astacus*, and we do not add the Megalopidea, as they appear to have closer relations with the Anomoura. The following are the families adopted:

1. *Antennæ externæ squamâ basali non instructæ. Pedes antici monodactyli.*

Fam. I. SCYLLARIDÆ.—Carapax valde depressus, marginibus lateralibus sat tenuibus, carapace lateraliter subito inflexo. Antennæ externæ laminatæ, breves. Sternum trigonum.

Fam. II. PALINURIDÆ.—Carapax subcylindricus, lateraliter late rotundatus. Antennæ externæ basi subcylindricæ, longæ. Sternum trigonum.

2. *Antennæ externæ squamâ basali instructæ. Pedes antici didactyli.*

Fam. III. ERYONIDÆ.—Carapax non oblongus, depressus, lateribus subito inflexis, abdomine multo angustiore.



Fam. IV. ASTACIDÆ.—Carapax oblongus, subcylindricus, abdomine parce angustiore. Sternum angustum.

In the first three families, the epistome is soldered to the inflexed carapax either side, nearly as in the Brachyura; in the last, this union takes place by a suture and is less perfect, the edge of the carapax being a little projecting.

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#### FAMILY SCYLLARIDÆ.

THE established genera of this family are Scyllarus, Ibacus, and Thenus. The genus Scyllarus is subdivided into sections by Milne Edwards; and these sections of Scyllarus, as well as others of Ibacus, are made into subgenera by De Haan, after a profound study of their characters. De Haan has not named the new divisions; and in adopting them as genera, we give names to those that are new.

1. *Carapax oblongus vel subquadratus, non transversus. Oculi versus cephalothoracis angulos externos insiti.*
  - G. 1. SCYLLARUS, *Fabr.*—Rostrum valde saliens. Latera carapacis non incisa. Antennæ externæ inter se fere contiguæ. Palpus maxillipedis externi flagello confectus. Branchiæ numero 21. Species, *Sc. sculptus, latus, squamosus, equinoxialis, Haanii, Sieboldi.*
  - G. 2. ARCTUS, *Dana* (Scyllari subgenus 5tum, *De Haan*).—Rostrum perbreve, truncatum. Antennæ externæ inter se remotæ. Palpus maxillipedis externi flagello carens. Branchiæ 19. Sp. *A. ursus, D.* (*Scyllarus arctus, Auct.*)
2. *Carapax plus minusve transversus, lateribus non incisus. Oculi in angulis externis.*
  - G. 3. THENUS, *Leach.*—Oculi oblongi. Rostrum bilobatum. Branchiæ 21.
3. *Carapax plus minusve transversus, lateribus incisus. Oculi angulis externis valde remoti.*
  - G. 4. PARRIBACUS, *Dana* (Scyllari subgenus 2dum, *De Haan*).—Rostrum sub-

triangulatum. Antennæ externæ inter se fere contiguæ. Oculi fere in medio inter antennas internas et angulos cephalothoracis externos. Branchiæ 21. Species, *P. antarcticus* et *P. Parræ* (*Ibacus antarcticus* et *I. Parræ*, *Auct.*)

G. 5. IBACUS, *Leach*.—Rostrum bilobatum. Antennæ externæ inter se paulo remotæ. Oculi versus rostrum insiti. Branchiæ 21. Species, *I. Peronii*, *I. ciliatus*, *De Haan*, et *I. novemdentatus*, *Gibbes*.

The species mentioned are given by Milne Edwards, in his *Crustacés*, ii. 279–289, excepting *Sc. Haanii* of von Siebold, which is described in *Faun. Japon.*, 152, pl. 38, f. 1, and by Berthold, in *Gött. Gel. Anz.*, 1845; *Sc. Sieboldi*, *De Haan*, *Faun. Japon.*, p. 153, pl. 36, f. 1; *Ibacus ciliatus*, von Siebold, *Spicilegia Faunæ Japonicæ*, 15, and *Faun. Japon.*, 153, pl. 36, f. 2; and *I. novemdentatus*, *Gibbes*, in *Proc. Assoc. Amer.*, *Charleston Meeting*, 1850, iii. p. 193.

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#### IBACUS ANTARCTICUS (*Rumph.*)

Plate 32, fig. 6, animal, natural size.

Upolu, Navigator or Samoa Group.

Length, seven and three-fourths inches; breadth across the line of the eyes, three and two-thirds inches; between the eyes, one and eleven-twelfths inches. Colour, yellow or smoky yellow, clouded with smoky brown and some spots of carmine; around the eye carmine. Last abdominal segment, deep ochre-yellow and short hirsute. Eye situated just exterior to base of outer antennæ. Surface of body without spines, squamato-tuberculate. Carapax with seven profound incisions laterally, each hirsute within; second incision deepest. Lateral portions of second and third abdominal segments extend outward and curve forward, with two deep incisions; the following one also extends outward, and has a deep incision, but its extremity is not anterior to its front margin. Legs projecting but little beyond the carapax.

#### ARCTUS VITIENSIS.

*Carapax subtilissimis plumulis pubescens, spinâ pone medium frontis et alterâ gastricâ armatus, versus orbitam utrinque subcarinatus et 1-2-dentatus. Antennæ internæ nudiusculæ, articulo basis penultimo fere*



*duplo longiore quam ultimus. Antennæ externæ extremitate truncatæ, articulo ultimo apice 5-lobato, lobis oblongis, interno brevior, articulo 2do ultimum fere superante, extus unidentato, intus 3-dentato, superficie carinatâ, carinâ integrâ. Pedes nudi, subteretes, inermes, 2dis pergracilibus, turso 2do duplo longiore quam 3tius.*

Carapax pubescent with exceedingly minute spinules, having a spine on the median line near the front margin and another on the gastric region, near the orbits either side subcarinate, and one or two-toothed. Inner antennæ nearly naked, penult joint of base nearly twice as long as last joint. Outer antennæ truncate at extremity, last or fourth joint with five deep lobes, inner lobe shorter, second joint extending a little farther forward than last joint, having the outer margin one-toothed, and inner three-toothed, with an even carina (not toothed) on its surface. Feet naked, subterete, and not angulate, unarmed; second pair very slender, the tarsus twice longer than tarsus of third pair.

Plate 32, fig. 7 *a*, animal, enlarged four diameters; *b*, sternum, *ibid.*; *c*, leg of first pair, *ibid.*; *d*, leg of second pair, *ibid.*; *e*, leg of third pair, *ibid.*; *f*, abdominal appendage of second segment; *g*, inner antennæ.

#### Feejee Islands.

Length, one inch. The surface of the carapax and of the outer antennæ is covered with short minute plumes, mostly obscuring the tubercles. The anterior spine of the carapax is simple; the gastric has three or four squamiform tubercles, posterior to it; and then follows a smooth surface; then, just behind middle of carapax, on the median line, there is a prominent ridge extending backward, which is made up of two series of squamiform tubercles, but little prominent except the anterior. The second and third abdominal segments have a median piece, which is lobed anteriorly; and either side, the posterior half of the surface has a regularly lobed appearance, while the anterior half is but faintly divided into a few areolets; the fourth and fifth are also divided into areolets in two transverse series; but the series are nearly equal. The sternum is very broad for its length, with the two lobes in front rounded. The tarsi of the first and third pairs are nearly equal.

## FAMILY PALINURIDÆ.

THE Palinuridæ of our present seas have been divided into two sections or subgenera of a single genus *Palinurus*, by Edwards and De Haan, being called *Palinuri communes* and *P. longicornes*, and into two genera by Gray. The species of these sections differ much in aspect; and their distinguishing characters are believed by us, sufficient to authorize the adoption of Gray's genera.

Still a third genus, which he names *Linuparus*, is proposed by Gray, for the *Palinurus trigonus*, De Haan, and the allied species. These belong to the first section, and to the genus *Palinurus*, as adopted.

- G. 1. PALINURUS, *Fabr.* — Carapax vix rostratus. Annulus antennalis supra angustissimus, curvatus. Antennæ externæ basi fere contiguous. Antennæ internæ flagellis breves.
- G. 2. PANULIRUS, *Gray.* — Carapax non rostratus. Annulus antennalis supra latus, subquadratus et horizontalis. Antennæ externæ basi remotæ. Antennæ internæ flagellis longæ.

PALINURUS LALANDII, *Lamk.*

Cape of Good Hope.

PANULIRUS SPINOSUS (*Edw.*), *Gray.*

Pacific Islands.

PANULIRUS PENICILLATUS (*Olivier*), *Gray.*

Pacific Islands.



We are unable to distinguish the separate localities of the *P. spinosus* and *P. pencillatus* owing to the loss of labels through the opening of the specimens at Washington, before the return of the Expedition.

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#### FAMILY ASTACIDÆ.

THE Astacidæ, in the form of the body and in general habit, approach the Caridea. But the epistome is united to the shell either side, although not so neatly as in the preceding families, since this union is by a kind of adhesion of the parts, the edge of the shell where it meets the epistome being distinct and somewhat projecting. The basal scale of the outer antennæ is, in general, much shorter and narrower than in most of the Caridea. There is, however, a gradation from the small size found in the Madagascar Astacoides, to the expanded form in Paranephrops. The anterior legs are the largest, and terminate in short hands. The next two pairs have small hands, but are scarcely stouter or longer than the remaining two pairs, which are simply unguiculate. Unlike any of the Caridea, the carapax in all the species has a strong transverse suture; and in the posterior dorsal region, traces of two longitudinal sutures may be generally distinguished, which are analogous to those in the Thalassinidea, Paguridea, and Æglea.

In the work of Edwards, this family includes only three genera, *Astacus*, *Nephrops*, and *Homarus*. These genera are adopted by De Haan, who at the same time points out other unnoticed distinctions between them. In a recent elaborate revision of the Astaci by Erichson (Archiv. f. Nat., 1846, p. 86, and 375), other subdivisions are proposed, as subgenera of the genus *Astacus*. These subgenera are *five* in number. In three of them, the first segment of the male abdomen is without appendages, while they are present in the other two. Of the latter, one subgenus (*Astacus*, mostly European), has a pair of branchiæ attached to the base of the fifth pair of legs; and another (*Cambarus*, mostly American), is without this pair of branchiæ. Of the former, *one* genus (*Astacoides*, *Guérin*), has the abdominal feet

wholly membranous, and the caudal segment undivided; in a *second* (Cheraps), these feet are calcareous, the caudal segment is membranous in its posterior segment, and the legs of the fifth pair are without branchiæ; in a third (Engæus), the legs of the fifth pair are furnished with branchiæ, the caudal extremity is as in *Astacus*.

Erichson adds in his characteristic of these subgenera, that in all of them, excepting Engæus, the outer antennæ are situated *exterior* to the inner antennæ, while in the genus just mentioned, they are *under* the inner antennæ,—a character in which the several species of *Astaci* widely differ, yet restricted, without sufficient study, we think, to the Engæi alone.

The subgenus *Astacoides* was first established by Guérin, in 1839 (Rev. Zool., p. 109), for the *A. madagascariensis* of Edwards, which he described the same year, under the name *Astacoides Goudotii*. Guérin erred in overlooking the small basal scale of the outer antennæ, and based his genus on its supposed absence.

The year preceding the publication of Erichson's Memoir, J. E. Gray, Esq., published a paper on some *Astaci* from New Holland, in an Appendix to Eyre's Discoveries in Central Australia,\* in which he suggests that the genus *Astacus* may be divided into three sections, distinguished as follows:—1. Caudal segment bipartite, and each part hard and calcareous, as in *A. fluviatilis*, *A. Bartonii*, &c.; 2. Caudal segment not divided, calcareous quite to its extremity, as in *A. madagascariensis*, Edwards,† and *Franklinii*, Gray; 3. Caudal segment entire, or only slightly divided near the middle of each margin, with the texture thin and flexible posteriorly, as in *A. 5-carinatus*, Gray, *A. 2-carinatus*, Gray, and *A. chilensis*, Edwards.

In laying down these sections, the caudal segments and appendages afford the principal characters, while the existence or not of appendages to the first abdominal segment, and the presence or not of a branchia at the base of the fifth pair of legs, points seized upon by Erichson, are overlooked by Gray.

With regard to the absence of the branchia from the legs of the fifth pair in the American *Astaci*, the fact was first noticed by De Haan, who examined particularly the *A. Bartonii*, and *A. affinis*, and men-

\* Journals of Expeditions of Discovery into Central Australia, in the years 1840, 1841, by Edward John Eyre. 2 vols., 8vo., London, 1845. Appendix, p. 410.

† Edwards says, that in the *Madagascariensis* the lateral appendages of the tail are semicorneous towards their posterior border. Archives du Muséum d'Hist. Nat. 1839.



tions it in his Faun. Japon., p. 160, stating also, that these species are thereby related to the Thalassinidea. Erichson, on examination, found that the same was true of the *A. pellucidus*, *A. carolinus*, *A. cubensis*, and *A. mexicanus*, other American species. This law has its exceptions, since the author has found an Oregon species, *A. leniusculus*, D., in which the fifth pair of legs has its pair of branchiæ, as in the European species.

Among the distinctions subdividing the genus *Astacus*, that of the presence or absence of prehensile appendages to the first abdominal segment in males, fitted for use in coition, appears to be of the first importance. These appendages are long in the European and American *Astaci*, and those of the second pair are also modified for the same end, so as to differ from those of the third and following pairs. But in the Madagascar and most Australian species, according to Erichson, these appendages are wanting, and the second pair are like the following. In the former, the caudal segment is divided transversely, and in the latter, it is not at all divided, or imperfectly so. But the texture of the caudal segment, whether calcareous or not to its tip, cannot be of much value in classification, for it varies in the same species with age, and must, therefore, be somewhat dependent on the size of the species. The presence of a branchia to the posterior pair of legs may prove to be a characteristic of importance, requiring a subdivision accordingly; but of this we doubt. In the American species without this branchia, which the author has examined, the medial postero-dorsal region of the carapax is narrow linear, while in the European species, and that from Oregon, having the full number of branchiæ, this region is quite broad. But we cannot say how far this is generally true.

For the reasons stated, we accept of *Astacoides* as a distinct genus, separated from *Astacus* by the absence of appendages from the first segment of the abdomen; and we unite with it, *Cheraps* and *Engæus* of Erichson. The occurrence of the Engæi in holes in moist earth, is not peculiar to that group, for the same habit has been observed by Prof. S. F. Baird in an American species. *Cheraps* may perhaps be retained as a subgenus under *Astacoides*, on account of the absence of the posterior branchiæ; and on the same ground, and no other of importance, *Cambarus* may be received as a subgenus under *Astacus*.

Another genus has been added to the Astacidæ by Adam White, called *Paranephrops*. It has the basal scale of the outer antennæ

much longer than the base of these organs, and, moreover, the species, unlike those of Nephrops, are fresh-water. Through Nephrops and Paranephrops the Astacoidea graduate towards the Caridea.

The genera of living Astacidæ adopted, will then be as follows:—

1. *Manus crassæ et latæ, marginibus arcuatæ, superficie convexæ* (ASTACINÆ).

A. Branchiæ 19. Segmentum thoracis ultimum non mobile.—Species marinæ.

G. 1. HOMARUS, *Edwards*.—Rostrum tenue, utrinque paucidentatum. Squama basalis antennarum externarum perbrevis.

B. Branchiæ 17–18. Segmentum thoracis ultimum mobile. Rostrum integrum vel utrinque unidentatum.—Species fluviales.

G. 2. ASTACOIDES, *Guérin*.—Segmentum abdominis *maris* 1mum appendicibus carens.—Subgen. *Astacoides*, branchiis 18; *Cheraps*. (*Erich.*) branchiis numero 17.

G. 3. ASTACUS.—Segmentum abdominis *maris* 1mum appendicibus instructum. Subgen. *Astacus* branchiis 18; *Cambarus*, (*Erich.*) branchiis numero 17.

2. *Manus prismaticæ, lateribus fere rectæ* (NEPHROPINÆ).

G. 4. NEPHROPS, *Leach*.—Rostrum utrinque dentatum vel spinosum. Squama basalis antennarum externarum basi vix longiores.—Species marinæ.

G. 5. PARANEPHROPS, *White*.—Rostrum ac in *Nephrope*. Squama basalis antennarum externarum basi dimidio longiores.—Species fluviales.

In some recent English works, the name *Potamobius* has been substituted for *Astacus*, and *Astacus* for *Homarus*, following *Leach*, who, in 1819, made this arrangement of the species at that time referred to *Astacus*. In the nomenclature generally adopted, as is well known, the system of *Edwards* is followed, who, in the second volume of his *Crustacés*, subdivided the old genus *Astacus* in the same manner as *Leach*, but gave the name *Homarus* to the marine species, and retained *Astacus* for the rest of the genus. In the *Catalogue of Crustacea of the British Museum*, published in 1847, the names of *Edwards* are used, while in the *Catalogue of British species*, published in 1850, *Leach's* nomenclature is adopted.

*Leach* has undoubted priority, and exhibited his usual discrimination in proposing the subdivision of the old genus. But the appropriating of the name *Astacus* to the single marine species, violates



established principles in nomenclature. For it is giving the old name to far the smaller, instead of the larger and more characteristic part of a genus,—an objection which, if not holding against Leach himself, since the genus at the time of its subdivision by him contained but two species, is still, at the present day, seen to be of much weight. It is giving a name which belonged pre-eminently to one of the fresh-water species, the common one of Europe, and which is properly, therefore, the type of the old genus, to a division of this genus which does not include the typical species; for Gesner, as long ago as in the 16th century, called the common species of the European streams *Astacus fluviatilis*, and Linnæus named it *Cancer astacus*, both names including the name *Astacus*,—while the marine species, although early named *Astacus marinus*, was called by Linnæus, *Cancer Gammarus*. Besides this, it is introducing much confusion into the science, not only by changing the long-established names of species, but by giving a new use to the name once applied by Risso to a species of the genus *Telphusa*. There seem, therefore, to be reasons enough for rejecting Leach's names, if it is of no weight that they remained for thirty years unrecognised by British authors.

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#### ASTACUS LENIUSCULUS.

*Rostrum tridentatum, dentibus acutis, medio tenuiter elongato. Carapax lævis, punctulatus, lateraliter pone rostrum utrinque 2-spinosus; areolâ inter suturas longitudinales post-dorsales latâ. Pedes antici compressi, inermes, non tuberculati, manu lævi, punctulatâ, carpo paulo oblongo, intus recto, inermi, apice interno acuto excepto, brachio antice denticulato, apice interno elongate acuto, dorso unispinoso. Pedes sequentes nudiusculi. Segmentum caudale parce oblongum, lateribus fere parallelis. Pedes 5ti branchias parvas gerentes.*

Beak tridentate, teeth acute, middle tooth slender elongate. Carapax smooth punctulate, behind beak either side with two spines (the posterior obsolescent in young individuals); postero-dorsal areolet between the longitudinal sutures broad. Anterior feet compressed, in no part tuberculate or spinous, hand smooth, punctulate; carpus

but little oblong, inner margin straight, unarmed, except a short spine at apex; arm with anterior margin denticulate, and a longer tooth at apex, on outer margin, short distance from apex, unispinous. Following pairs of feet nearly naked. Caudal segment sparingly oblong, sides nearly parallel. Fifth pair of feet bearing small branchiæ.

Plate 33, fig. 1 *a*, male, natural size; *b*, a younger individual, having the two posterior spines of frontal part of carapax obsolescent.

Columbia River and Puget's Sound.

Length of largest specimen, four inches. In the younger specimen the hands are nearly equal, while in the larger they are much unequal, the left being the larger. The punctulations of the surface are slight impressions, each bearing one or more very short and minute hairs.

ASTACUS (CAMBARUS) BARTONII (*Fabr.*), *Erichson.*

Plate 33, fig. 2 *a*, carapax and antennæ, natural size; *b*, larger hand; *c*, caudal segment.

Locality uncertain; possibly from Brazil.

The beak is entire, and terminates in a low angle; either side of its base, along the carapax, there is a low ridge, but no spines. The post-medial areolet is narrow linear, enlarging somewhat anteriorly and more posteriorly—for the exhibition of which fact, and a comparison with the corresponding part in the European and Oregon species, the figure of the carapax has been introduced into the Atlas. The hand has its upper surface and the fingers pitted and in part small tuberculate.

*Astacus Bartonii*, FABR., Supp., p. 407; SAY, Jour. Acad. Nat. Sci. Philad., i. 167; HARLAN, Med. and Phys. Res., p. 230, plate facing p. 230, f. 3.

*A. Cambarus Bartonii*, ERICHSON, Arch. f. Nat., 1846, 97.

*Astacus affinis*, EDWARDS, Crust., ii. 332.



## ASTACOIDES NOBILIS.

*Rostrum sat longum, fere integrum, apice obtusum, utrinque obsolete unidentatum, basi antennarum externarum paulo brevius. Carapax lateraliter infra rostri basin obsolete utrinque armatus. Abdominis segmenta utrinque paulo uni-tuberculata, junioris tuberculis obsolescentibus; segmentum 2dum prope marginem lateralem spinis brevibus armatum; segmentum caudale paulo oblongum. Pedes antici æqui, crassi, carpo intus elongatè trispinoso, manu infra supraque marginatâ et breviter dentatâ, superficie fere lavi, nudâ. Epistomatis processus medianus anticus triangulatus et elongatus, et perangustus.*

Beak rather long, nearly entire, apex obtuse, and either side having an obsolete tooth, a little shorter than base of outer antennæ. Carapax obsoletely armed on either side below base of beak. Segments of abdomen more or less distinctly uni-tuberculate, the tubercles on younger individuals obsolescent; second segment with short spines near lateral margin; caudal segment a little oblong. Anterior feet equal, stout, carpus very prominently three-spinous, hand above and below with a prominent margin, which is short dentate, surface nearly smooth, naked. Anterior median process of epistome triangular, very narrow and elongate.

Plate 33, fig. 3 *a*, animal, natural size; *b*, anterior part of epistome, with base of outer antennæ either side.

New South Wales?

Length of body to extremity of beak, five inches. In a younger specimen, three inches long, the segments of the abdomen have but a faint tubercle on upper surface either side, while in the large one, the same surface is quite prominent in a transverse line somewhat oblique, and there is a more prominent point constituting the tubercle. The anterior triangular part of the epistome is quite oblong in the large specimen, and but little so in the smaller; it projects in both nearly to apex of second basal joint. In both, the base of the outer antennæ is close alongside of this part of the epistome, and beneath the other pair of antennæ. The head is narrow, and the epistome, in

a lateral profile view, is broad and long, and nearly vertical in direction.

PARANEPHROPS TENUICORNIS.

*Rostrum elongatum, acuminatum, tenue, bases antennarum longitudine superans, utrinque 4-spinosum et posterius super carapacem utrinque aliis spinis duabus. Pedes 8 postici gracillimi. Pedes antici longi, manu vix crassiore quam carpus, margine superno biseriatim spinoso, superficiebus internâ externâque uniseriatim spinosis, margine inferiore et superficie proximâ spinuli-scabris et non seriatim spinosis.*

Beak elongate, acuminate, slender, reaching beyond the bases of the antennæ, on either side armed with four spines, and posteriorly on the carapax, other two spines. Eight posterior feet very slender. Anterior pair long, hand hardly stouter than carpus, upper margin with two unequal rows of spines, outer and inner surface each with a single row, lower margin and surface adjoining spinuli-scabrous, and not seriately spinous.

Plate 33, fig. 4 *a*, animal, natural size; *b*, under view of head, enlarged four diameters; *c*, outer maxilliped.

Fresh-water streams of New Zealand, about the Bay of Islands.

Length, three to four inches. Colour, olive-green to brown. Body smooth; a little hirsute on upper surface of beak. Two small spines near either lateral part of transverse suture. Anterior prolongation of epistome oblong triangular, acute, and distant from base of outer antennæ. The basal scale of outer antennæ with outer apex acutely prolonged; also a short point at inner apex, though mostly concealed by the fringe of plumose setæ, which extends along the inner margin, even to the outer apex. Four or five spines on side of carapax about the latero-anterior angle, two of them being on the margin. No appendages to anterior abdominal segment in male, and those of the following segments similar to one another, quite small and slender.

Unlike species of *Astacus*, the base of the outer antennæ is remote



from the anterior projecting part of the epistome, and the base of the inner antennæ is wholly inside of the base of the outer. Spines are situated on the joints, as shown in figure *b*.

This species is near the *planifrons*, but has a narrower and more slender beak, with four spines either side on the beak itself, besides having no prominent spines on the lower margin of the hand.

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### SUBTRIBE III. CARIDEA.

IN arranging the Caridea into groups, much stress is usually laid upon external form and length of beak. The unimportance of these characters might be inferred, from the fact that they involve no striking variations of structure: nothing but their running parallel with other characteristics of real value could entitle them to paramount consideration. A survey of the species of a single group, enables us to discover their subordinate rank. In the Crangon group, in which the form is commonly depressed and the beak short, there are species as much compressed and as long rostrate as the typical Hippolyte, with the same form and general habit; and the depressed, short-beaked Pontoniæ graduate into the compressed, long-rostrate Palæmon, by so insensible gradations, and differ from them so little in essential characters, that both groups are parts of a common family.

The relative positions of the first and second pairs of antennæ would seem to be a character of more value. But this position varies directly with the breadth or depressed form of the species; so that in the same genus Pontonia, as this genus is laid down by Edwards, these antennæ may be either in the same horizontal line, or the first more or less over the second. It is not a character indicating superiority of grade; for those Brachyura are of higher rank in which the pairs of antennæ are most nearly one above the other, while among the Macroura the reverse is true, to at least a great extent.

Among the organs of Crustacea, those earliest in development are the *mandibles*, and any essential differences they present, are, therefore, of early origin and of a fundamental character, compared with

those of other organs posterior to them in position. The constancy of character observed in these parts throughout the Brachyura, amid all the diversities among the species, is evidence of their prime value in classification. Were they less fundamental in their relations, we should find them undergoing modifications like the maxillæ, maxillipeds, and legs; for those parts that are lowest in relative rank are those which are most liable to changes. Such are the legs, and the hinder legs for like reason are subject to the widest variations in size, with less differences in other respects than the anterior legs.

We should, therefore, give a prominence to the peculiarities of the mandibles, in our endeavours to trace out the limits of groups. De Haan, in his work on the Crustacea of Japan, has recognised their importance, and his groups are partly based upon the characters they afford. In this respect we adopt his method, yet with some modification of his subdivisions.

The mandibles may be viewed as of four distinct types.

1. Form slender, simple, much inflexed, with the crown not enlarged or dilated; as in *Crangon* and *Nika* (Plate 33), &c.

2. Form stout, simple, not inflexed, with a broad dentate terminal crown, as in the *Penæidæ*. The organ is placed very obliquely.

3. Form stout, nearly simple, the crown broad, somewhat divided into a terminal and lateral process, the terminal short and dilated; as in *Atya* (Plate 34, fig. 1) and the allied.

4. Form stout, deeply furcate above, so as to have a terminal and lateral process, each long and narrow; as in *Palæmon*, *Alpheus*, &c. (see Plates 34, 35, 36).

These forms are characteristic of prominent sections of the Caridea; sections that are well sustained by other peculiarities of structure.

Besides these peculiarities, the mandibles differ in bearing or not bearing a palpus. This distinction appears at first to be of no less consequence than those pointed out. But it is to be observed, that the portion of a mandible which is of most essential importance in the performance of its functions, is the crown. Differences in this part show difference of habit, and corresponding differences in some points of structure. But the palpus is a small, jointed, accessory appendage, having the same uses as the inner maxillæ and not affecting by its presence or absence the capability of the mandible to fulfil its end. This view is sustained by a reference to the species themselves. Among the *Palæmons*, the organ varies greatly in size, being rela-



tively large in some species, and quite short and slender in others; and there is, also, a gradation from species with a three-jointed palpus, to those in which this appendage is almost obsolete, consisting of but two very small joints. Such changes occur among species that would be called true Palæmons. And it is a fact worthy of note, that the length of the palpus varies with the disjunction of the flagella of the inner antennæ. If the two flagella that are conjoined at base are united only for a very short distance, the palpus is long; if nearly to the summits of these flagella, the palpus is reduced to two joints. Again, if the union is almost or quite through the entire length of the flagella, the palpus is altogether obsolete. Hence, the existence or absence of a palpus is equivalent among the Palæmonidæ to the existence of three or two flagella to the inner antennæ; and no other essential characters, higher than those of generic value, accompany such variations.

It is, therefore, true, both on general and specific considerations, that the presence or absence of the palpus is a fact of far less taxonomic value than the differences in the form of the crown or triturating portion of the mandible. It may guide in subdividing into genera, but cannot be used for grouping the genera themselves.

The differences in the mandibles lead to a subdivision of the groups into families. The slender incurved form of the mandible of Crangon, Nika, and Gnathophyllum, is of a wholly different character from the stout straight form and broad oblique crown of Atya, or the two-branched summit of the mandible in Palæmon, Hippolyte, and Alpheus: and the science is much indebted to De Haan for bringing forward these characters in his classification.

Besides the characters based on the mandibles, there are others which bear on the arrangement of the Caridea.

The development of the two outer pairs of maxillipeds into slender legs, which is sometimes observed, is a character of great value. It is commonly true that the outer pair is pediform, and thus the Macroura show their low rank; but when a *second* pair is also pediform, it marks another step of degradation, evincing a further diffusion of the forces posteriorly, along the ganglionic cord. This peculiarity is a source, therefore, of important distinctions among the species.

The presence of the palpus of the thoracic legs, and its enlargement to a natatory appendage in some species, a prominent characteristic of the Schizopods, can hardly be employed in subdividing the

Caridea. Even in the inferior group of Oplophorinæ, we have one genus without the palpi, and another with them much elongated. The Penæoids, also, illustrate the little importance to be attached to this development of the palpus of the legs.

We cannot regard, moreover, in studying out the families, the length of the beak, or the relative position of the pairs of antennæ.

De Haan has observed that in some of the genera, the carapax behind overlaps laterally the first abdominal segment, and in others, the first abdominal segment overlaps the margin of the carapax. The latter must be considered as evidence of a higher grade than the former, since the body is more firmly compacted by this method of connexion, while the free carapax is a universal characteristic of the lowest grade of the Macrourea, as well as of the Anomobranchiates. But we have not been able to verify his application of this character in laying down his subdivisions, neither have we succeeded in applying it as a basis of arrangement. His "Palæmonidea" and "Alpheidea," as far as we have examined specimens of the species, have the abdominal segment overlapping the carapax, no less than the "Crangonidea" and "Atyadea," although De Haan's characteristic makes it otherwise.

The natural families at which we arrive from our survey of the subject, are as follows: while they diverge widely from the system of Milne Edwards, they coincide in part with those of De Haan, though under a different general arrangement.

1. *Maxillipedes 2di breves, lamellati.*

Fam. I. CRANGONIDÆ. — Mandibulæ graciles, valde incurvatæ, non palpigeræ, coronâ angustâ et non dilatâtâ. Pedum pares 1mi 2dique inter se valde inæqui.

Fam. II. ATYIDÆ. — Mandibulæ crassæ, non palpigeræ, coronâ latâ, parce bipartitâ, processu terminali brevi et dilatato. Pedum pares 1mi 2dique inter se æqui, carpo nunquam annulato.

Fam. III. PALÆMONIDÆ. — Mandibulæ crassæ, sive palpigeræ sive



non palpigeræ, supra profunde bipartitæ, processu apicali oblongo, angusto.

2. *Maxillipedes 2di tenuiter pediformes.*

Fam. IV. PASIPHÆIDÆ.—Mandibulæ uti in *Atyidis*.

It will be observed, that the *Alpheus* group is not a separate division in this classification, but is included with the *Palæmonidæ*. Among the characters usually given to it, there are none that are important as distinctions, and any application of them is full of exceptions and difficulties. The absence of a beak in the genus *Alpheus* gives a peculiar appearance to the species; but this character does not belong to the other accepted *Alpheidæ*. The genus *Pontonia* is closely related to *Palæmon*, much more nearly than to *Alpheus*. A depressed form and short beak characterize some of the species; but from these there is a transition by slight shades, of difference, to *Palæmon*. In both groups, the hands of the second pair of legs are stout, whereas, in *Alpheus*, they are filiform and annulated.

In the farther subdivision of the families into subfamilies, we deem it of the first importance to regard the relative character of the first and second pairs of legs. The distinction between them is so wide and unvarying, through all the *Brachyura*, that characters based on the differences, cannot be of small value among the *Macroura*. We, therefore, place the species having the *first* pair the stouter in a separate subfamily from those in which the *second* is the stouter.

We here present a synopsis of the families, subfamilies, and known genera.

FAM. I. CRANGONIDÆ.

SUBFAM. 1. CRANGONINÆ.—Pedes 1mi 2dis crassiores. Maxillipedes externi pediformes. Digitus mobilis in manus marginem claudens, immobilis spiniformis. Pedes 2di non annulati.

G. 1. CRANGON, *Fabr.*—Rostrum brevissimum. Oculi liberi. Pedes 2di chelis armati, 4ti 5tique acuminati, gressorii.

- G. 2. SABINEA, *Owen*.\*—Rostrum brevissimum. Oculi liberi. Pedes 2di chelis carentes; 4ti 5tique acuminati, gressorii.
- G. 3. ARGIS, *Kröyer*.†—Rostrum nullum. Oculi sub carapace fere occulti. Pedes 2di chelis armati.
- G. 4. PARACRANGON, *Dana*.—Rostrum elongatum. Oculi liberi. Pedes 2di obsoleti, 4ti 5tique acuminati, gressorii.

SUBFAM. 2. LYSMATINÆ. — Pedes 1mi 2dis crassiores. Maxillipedes externi pediformes. Digiti subæqui uno ad alterum claudente. Pedes 2di annulati.

- G. 1. NIKA, *Risso*.—Rostrum breve. Antennæ internæ duobus flagellis confectæ. Pedes antici impares, uno chelato, altero monodactylo. Carpus paris 2di elongatus, annulatus.
- G. 2. LYSMATA, *Risso*.—Rostrum elongatum, subensiforme. Antennæ internæ tribus flagellis confectæ. Pedes antici ambo chelati. Carpus paris 2di elongatè filiformis.
- G. 3. CYCLORHYNCHUS, *De Haan*.‡—Rostrum sat breve, compressum et suborbiculare. Carpus 2dus brevis, pauci-annulatus.

SUBFAM. 3. GNATHOPHYLLINÆ. — Pedes 2di 1mis crassiores. Maxillipedes externi lati, operculiformes.

- G. 1. GNATHOPHYLLUM, *Latreille*.

FAM. II. ATYIDÆ.

SUBFAM. 1. ATYINÆ.—Pedes thoracici palpo non instructi.

- G. 1. ATYA, *Leach*.§—Rostrum breve, depressum. Antennæ internæ flagellis duobus confectæ. Pedes 4 antici sat breves, carpis sublunatis, cuspidè inferiore manum ferente, digitis penceillo setarum longo ad apicem armatis; 3tii 5tis multo longiores et crassiores.
- G. 2. ATYOIDA, *Randall*.||—Rostro, antennis pedibusque anticis *Atyæ* affinis. Pedis 3tii tenues, 5tis breviores. [An distinctio valida?]
- G. 3. CARIDINA, *Edwards*.—Rostrum sat breve sat longum. Antennæ internæ flagellis duobus confectæ. Pedes 2di 1mis longiores, digitis parium amborum

\* Owen, Append. Voy. Capt. Ross, p. 82.—*Crangon septemcarinatum*, Sabine.

† Tidskrift, iv. 1843, p. 217.

‡ Faun. Japon. Crust., p. 174.

§ In a paper on new species of *Atya*, by G. Newport, in the Ann. Mag. Nat. Hist., xix. (1847), 158, a species is attributed to *Apia*, Upolu, in New Zealand. *Apia* is on the Island of Upolu, which is one of the Navigator or Samoan Group, in the Pacific.

|| Journ. Acad. Nat. Sci. Philad., viii. p. 140.



apice penecilli armatis, carpis 1mis perbrevibus et antice excavatis, 2dis subcylindricis oblongis.

SUBFAM. 2. EPHYRINÆ.—Pedes thoracici palpo instructi.

- G. 1. EPHYRA, *Roux, De Haan*.\*—Rostrum dentatum. Antennæ internæ flagellis duobus confectæ. Pedes 4 antici parvi, nudi vel nudiusculi. Pedes 6 postici graciles.

FAM. III. PALÆMONIDÆ.

SUBFAM. 1. ALPHEINÆ.—Pedes 1mi crassiores, chelati, 2di filiformes, carpo sæpius annulati et chelati. Mandibulæ palpigeræ.

- G. 1. ALPHEUS, *Fabr.*—Rostrum brevissimum. Antennæ internæ flagellis duobus confectæ. Oculi sub carapace occulti. Manus paris 2di major non inversa, digito mobili superiore. Pedes 2di carpo filiformes, annulati. Maxillipedes externi subtenues, mediocres.—Species maris calidioris.
- G. 2. BETÆUS, *Dana.*—Rostrum nullum. Oculis et ceteris *Alpheo* plerumque affinis. Manus paris 2di major fere inversa, digito mobili inferiore vel exteriore.—Species maris frigidioris.
- G. 3. ALOPE, *White*.†—Rostrum breve, inter spinas duas longas insitum hisque sæpe partim celatum. Antennæ internæ flagellis duobus confectæ. Maxillipedes externi longissimi. Oculi paulo salientes.
- G. 4. ATHANAS, *Leach.*—Rostrum breve. Antennæ internæ flagellis tribus confectæ. Oculi paulo salientes. Pedes 2di carpo annulati.
- G. 5. HIPPOLYTE, *Leach*.‡—Rostrum sat longum, plus minusve ensiforme, non mobile. Abdomen medio deflexum. Antennæ internæ flagellis duobus confectæ. Oculi salientes. Pedes 2di carpo annulati.
- G. 6. RHYNCOCINETES, *Edwards.*—Rostrum ensiforme, mobile, fronte articulo-conjunctum. Oculi antennæque uti in *Hippolyte*. Pedes 2di carpo non annulati.

[Ubi pertinet genus sequens?

- G. AUTONOMEA, *Risso.*—Pedes antici crassi, chelati. Pedes 2di non chelati et carpo non annulati, 3tiis similes. Maxillipedes externi tenues. Rostrum breve. Oculi salientes. Antennæ internæ flagellis duobus confectæ; externæ squamâ basali non instructæ.]

SUBFAM. 2. PANDALINÆ.—Pedes antici gracillimi, non chelati, 2di filiformes, carpo annulati.

\* De Haan, Faun. Japon., p. 185, pl. 46, f. 7.

† Ann. and Mag. Nat. Hist., [2] i. 225.

‡ Pericliuenes, *Costa* (Ann. dell' Acad. degli Aspir. Nat. di Napoli, ii. 1844), hardly differs from *Hippolyte*, according to *Erichson*, Arch. f. Nat., 1846, p. 310.

G. PANDALUS, *Leach*.

SUBFAM. 3. PALÆMONINÆ.—Pedes 4 antici chelati, 2di 1mis crasiores, carpis nullis annulatis. Pedes nulli palpigeri.

1. *Antennæ internæ duobus flagellis confectæ. Mandibulæ non palpigeræ.*

- G. 1. PONTONIA, *Latreille*.—Corpus depressum. Rostrum breve. Oculi parvuli. Maxillipedes suboperculiformes, articulo 2do lato, 3tio 4toque simul sumtis longiore, his subcylindricis.
- G. 2. ŒDIPUS, *Dana*.—(Pontonia, *Auct.*) Corpus plus minusve depressum. Rostrum longitudine medioere. Oculi permagni. Maxillipedes externi latiusculi, articulis totis latitudine fere æquis. Tarsi infra elongatè gibbosi.
- G. 3. HARPILIUS, *Dana*.—(Pontonia, *Auct.*) Corpus non depressum. Rostrum longitudine medioere. Oculi magni. Maxillipedes suboperculiformes, articulo 2do lato, 3tio 4toque simul sumtis brevior, his subcylindricis. Tarsi uncinati, infra non gibbosi.
- G. 4. ANCHISTIA, *Dana*.—Rostrum tenue, sæpius ensiforme et elongatum. Corpus vix depressum, sæpe compressum. Oculi medioeres; antennæ duobus flagellis instructæ, unâ parce bifidâ. Maxillipedes externi omnino tenues, pediformes.

2. *Mandibulæ palpigeræ.*

a. Oculi aperti.

- G. 5. PALÆMONELLA, *Dana*.—Corpus non depressum. Rostrum sat longum, dentatum. Oculi medioeres. Mandibularum palpus bi-articulatus, perbrevis. Antennæ internæ flagellis duobus confectæ, uno apicem bifido. Maxillipedes externi tenues.
- G. 6. PALÆMON, *Fabr.\**—Corpus non depressum. Rostrum longum, dentatum. Oculi medioeres. Palpus mandibularum 3-articulatus. Antennæ internæ flagellis tribus confectæ. Maxillipedes externi tenues. Pedes 2di nunquam lamellati.
- G. 7. HYMENOCERA, *Latreille*.—Corpus non depressum. Rostrum sat longum. Oculi medioeres. Pedes 2di tenuiter laminati, latissimi; 1mi tenuissimi, manu minutâ. Maxillipedes externi subfoliacei.

b. Oculi sub carapace celati.

- G. 8. CRYPHIOPS, *Dana*.—Rostrum longitudine medioere. Oculi parvuli, omnino occulti. Antennæ internæ flagellis tribus confectæ. Maxillipedes externi subtenues.

[Ubi pertinet Genus TYPTON, *Costa* (Annal. dell' Acad. degli Aspir. Nat. di Napoli, ii. 1844); squamâ basali antennarum externarum carens; Pontoniæ affinis.]

\* *Leander*, Desmarest (Ann. Ent. Soc. France, 1849, p. 87), is here included.



SUBFAM. 4. OPLOPHORINÆ.—Pedes 1mi sive didactyli sive vergiformes; 2di chelati, crassiores. Squama antennarum externarum acuminata, extus spinis armata.

G. 1. OPLOPHORUS, *Edwards*.—Rostrum longum, dentatum. Antennæ internæ flagellis duobus confectæ. Pedes toti palpigeri, 4 antici chelati. [Abdominis dorsum processibus spiniformibus uno vel pluribus armatum.]

G. 2. REGULUS, *Dana*.—Rostrum longum, dentatum. Antennæ internæ flagellis duobus confectæ. Pedes nulli palpigeri, 2 antici non chelati, 2di crassè chelati. Mandibularum palpus 3-articulatus. [Abdominis segmentum 3tium dorso postico instar spinæ longæ productum.]

#### FAM. IV. PASIPHÆIDÆ.

G. 1. PASIPHÆA, *Savigny*.—Rostrum obsolescens. Antennæ internæ flagellis duobus confectæ. Pedes 4 antici subæqui, manubus gracilibus.\*

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#### FAMILY CRANGONIDÆ.

##### SUBFAMILY CRANGONINÆ.

##### CRANGON VULGARIS, *Fabr.*

Bay of San Francisco, California, and Puget's Sound, Oregon.

This species was first reported from the California coast by Owen, in the Voyage of the Blossom, Crust., p. 87.

##### CRANGON MUNITUS.

*Rostrum brevissimum, rotundatum. Carapax partim 7-carinatus, ca-*

\* Brief descriptions of the following new species of Macrourea are published by the author in the Proc. Acad. Nat. Sci. Philad., for January, 1852.

*rinâ mediâ (vel primâ) bispinosâ, 2dâ unispinosâ, brevi, 3tiâ nudâ, 4tâ unispinosâ, brevi. Abdomen læve, inerme. Manus nuda. Pedes 2di 3tiis vix breviores, 4ti 5tique paulo hirsuti, 5tis minoribus. Maxillipedes externi utrinque valde ciliati. Segmentum caudale apice subacutum et quatuor setis instructum.*

Beak very short and rounded. Carapax in part seven-carinate, middle carina bispinous, second, or next either side, with one spine anteriorly, third naked, fourth with one spine and short. Abdomen smooth, unarmed. Hand naked, thumb short. Second pair of feet hardly shorter than third, fourth and fifth somewhat hirsute, the last smaller. Outer maxillipeds long ciliate. Caudal segment subacute at apex, and having four slender setæ.

Plate 33, fig. 5 *a*, animal, natural size; *b*, extremity of caudal segment.

Puget's Sound.

Length of body, one inch and ten lines; of carapax, six lines. The flagellum of the outer antennæ is a little uneven, with short hairs. The extremity of the abdomen is short triangulate at apex. The spines of the carapax are nearly parallel with its surface.

#### GENUS PARACRANGON.

*Crangoni similis. Pedes 2di omnino obsoleti, 4ti 5tique acuminati, gressorii. Oculi liberi.*

Near *Crangon*. Second pair of feet wholly obsolete, fourth and fifth pairs acuminate, gressorial. Eyes free.

The only species of this genus is from Puget's Sound, and is rough with spines, besides having a long, reflexed beak, and an inflexed abdomen. The form is very much like that of an Hippolyte. There are eight specimens in the collections, and all agree in having the second pair of legs obsolete.



## PARACRANGON ECHINATUS.

*Rostrum elongatum, porrectum, apice bidentatum, dorso unidentatum, juxta basin infra unispinosum, spinâ longâ porrectâ. Carapax multispinosus, medio dorso inæque 4-dentatus, utrinque 5-7-spinosus. Abdomen superne partim carinatum, superficie paulo sculptum, lateribus acutis. Manus elongata, digito immobili longo et gracillimo. Pedes 4ti 5tique fere nudi, subæqui.*

Beak elongate, obliquely porrect, bidentate at apex, uni-dentate above near middle, at base below in front a long curved spine. Carapax multispinous, along middle of back unequally four-toothed, either side 5-7-spinous. Abdomen above partly keeled, somewhat sculptured, sides acute. Hand elongate, immoveable finger long and very slender. Fourth and fifth pairs of feet nearly naked subequal.

Plate 33, fig. 6 *a*, animal, natural size; *b*, under view, showing natural position of first, third, and fourth pairs of legs, the second pair being obsolete; *c*, upper view of carapax; *d*, profile of penult abdominal segment in vertical view; *e*, mandible; *f*, *g*, extremity of mandible, different views; *h*, second maxilliped; *i*, outer maxilliped.

Puget's Sound, Oregon, obtained by dredging.

Length of body, one and three-fourths inches. Length of beak half as long as carapax, or rather longer than the line of it along the back. The exterior maxillipeds are very slender and short hairy. The fourth abdominal segment has a tooth and inside of it an emargination either side of middle, and the fifth is nearly similar.

## SUBFAMILY LYSMATINÆ.

## NIKA HAWAIENSIS.

*Rostrum brevissimè triangulatum, oculis multo brevius, latius quam longum. Squama antennarum externarum basi internarum parce*

*brevior. Pedes antici subæqui, dexter chelatus, nudiusculus. Articulus pedis 2di 4tus 3tio vix longior, non annulatus; carpus 11-articulatus, articulis quatuor anticis vix disjunctis. Pedes 6 postici subæqui, nudiusculi, gracillimi.*

Beak very short triangular, much shorter than eyes, broader than long. Scale of outer antennæ, hardly as long as base of inner pair. Anterior feet subequal, right foot chelate, nearly naked. Fourth joint of feet of second pair slightly longer than third, not annulate; carpus eleven-jointed, first four joints faintly separated. Six posterior feet subequal, very slender, nearly naked.

Plate 33, fig. 7 *a*, female with eggs, enlarged, outer maxillipeds wanting; *b*, mandible; *c*, first maxilliped; *d*, second maxilliped; *e*, left hand leg of first pair; *e'*, same, more enlarged; *f*, leg of second pair; *g*, leg of third or fourth pair; *h*, tip of beak.

Lahaina, Island of Maui, Hawaiian Group, Pacific.

Length of body, eight lines (a female with eggs). The beak has a minute point below at tip, seen with a high magnifier, and also two minute hairs directed upward, as shown in figure *h*. The breadth of the triangular beak is about twice its length, and its length is not half the length of the eyes. The tarsi of the six posterior feet is unarmed on inner margin, but has numerous short setæ around it near tip. The mandible has two stout teeth above, with a more slender one, and a cutting edge on a little lower level, precisely as in Crangon. The base of the outer antennæ is nearly as long as the basal scale.

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#### FAMILY ATYIDÆ.

THE maxillæ and maxillipeds of the following species have a peculiar calcareous character, unlike the usual membranous texture of these organs. The mandible, though divided at summit into a ter-



minal and lateral process, still has the appearance of having a simple corona with a continuous cutting edge; yet the dentate portions are distinct, and the intermediate edge is setigerous or ciliate. The abdomen is twice as long as the carapax, and is not inflexed at the third joint.

GENUS ATYOIDA, *Randall*.

*Atyæ affinis*. *Pedes 6 postici tenues, 5ti 3tiis longiores.*

Near *Atya*. Six posterior feet slender, fifth pair longer than third.

Among the species of *Atya*, there is a very great difference as to the relative size of the third and following pairs of legs; and it seems possible that the transitions may be such as to render it unnecessary to sustain the genus *Atyoida*.

ATYOIDA BISULCATA? *Randall*.

*Rostrum oculis paulo longius, acutum, supra carinatum. Carapax infra oculos acutus, quoque angulis anticis lateralibus acute productus. Carpus pedum 4 anticorum antice valde excavatus, U-formis. Pedes 6 postici subtiliter scabriculi, 3ti 4tiqæ æqui, 5ti paulo longiores, parce tenuiores. Maxillipedes externi apicem squamæ antennalis non attingentes.*

Beak longer than eyes, acute, carinate above. Carapax below the eyes acute, and also at its lateral anterior angles acutely produced. Carpus of four anterior feet deeply excavate, U-shape. Six posterior feet minutely scabrous, third and fourth pairs equal, fifth a little longer and somewhat more slender. Outer maxillipeds not reaching to apex of antennary scale.

Plate 34, fig. 1 *a*, animal, enlarged two diameters; *b*, mandible, more enlarged; *b'*, crown in different position; *c*, first maxilla, outer view; *c'*, same, inner view; *d*, second maxilla; *e*, first maxilliped; *f*, second maxilliped with palpus broken; *g*, outer or third maxilliped;

*g'*, extremity of same, inner view, more enlarged; *h*, hand of second pair; *i*, extremity of leg of fourth pair.

Oahu, Hawaiian Islands.

Length of body, fourteen lines. The beak either side of the carina above is canaliculate or longitudinally concave, owing to the fact that the margin is a little raised. A strong spine on outer side of first basal joint of inner antennæ. The last joint of the outer maxillipeds is a little longer than the preceding, and terminates in a stout point or spine; it bears several longish black spines on its surface. The palpus is a little longer than the second joint. The four anterior legs are very nearly naked, excepting the black setæ at the tips of the fingers, which are as long as the fingers. The tarsi are short and stout, with four or five short spines below. The surface of the fourth and fifth joints of the six posterior legs is set with minute spinules in a few lines, giving it a scabrous character. The transverse sulci of the carapax mentioned by Dr. Randall, we do not observe in our specimen, and his figure of the leg of the third pair differs from this leg as observed by the author.

*A. bisulcata*, RANDALL, Jour. Acad. Nat. Sci. Philad., viii. 140.

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## FAMILY PALÆMONIDÆ.

### SUBFAMILY ALPHEINÆ.

#### GENUS ALPHEUS, *Fabricius*.

THE tooth or spine externally at the base of the inner antennæ, and the jointing of the carpus of the second pair of legs, afford convenient characteristics for distinguishing the species of *Alpheus* in addition to those commonly used. The first joint of the carpus may be very much shorter or much longer than the second, or equal to it, and



similar differences exist as regards the other joints. The third joint of the third and fourth pairs of legs often has a tooth on the lower apex, although unarmed in most species.

We separate from *Alpheus* the species without a beak, in which the hands of the anterior legs have a partially reversed position, the lower margin being either inward or upward, so that the moveable finger is below or outside. Of these we have made the genus *Bctæus*.

I. ROSTRUM MARGINE FRONTIS ORTUM, SUPERFICIE INTER OCULOS SÆPIUS LEVITER CARINATA.

A. Antennarum articulus Imus externarum spinâ externâ sive nullâ sive obsolecente armatus.

1. *Manus marginibus inferiore superioreque versus digitos excavata. Dens antennarum internarum basalis articulo 1mo non longior. Articulus pedum 3tiorum 3tius omnino inermis.*

a. Orbitæ margo inermis.

ALPHEUS EDWARDSII, *Audouin*.

Plate 34, fig. 2 *a*, front and antennæ, much enlarged; *b*, extremity of outer maxillipeds; *c*, larger hand (right); *d*, smaller hand; *e*, part of second pair of feet; *f*, part of third or fourth pair.

Cape Verdes, Island of St. Jago.

The species agree closely with the original figure in the work on Egypt, Plate 10, fig. 1, but not with Edwards's description, which represents the orbital margin as armed with a spine as long nearly as the beak, instead of arcuate and unarmed. The second joint of the inner antennæ is about one and a half times as long as either the first, or the third. The lamellar spine or tooth at the outer base of the inner antennæ extends to apex of first joint. Moveable scale of outer antennæ as long as base of inner antennæ, and shorter than base of outer. Legs rather long. Larger hand very stout, outer surface of hand having a sinuous furrow, extending backward from below the sinus in the superior margin; lower margin rounded; fingers short and stout and furnished with a few hairs principally towards

the margin in tufts; moveable finger broad, thin above, much longer than lower finger. Smaller hand narrow oblong, nearly linear, very thin hairy, fingers half as long as hand, similar, terete, hairs on inner margin not denser than on outer surface. Last joint of outer maxillipeds long pilose. Carpus of third pair of feet having joint 1 as long as 2+3+4; joint 2 and 5 equal; 3 and 4 equal, and together about as long as the second; hand as long as the two preceding, a very few light hairs on the fingers. Following two pairs of feet rather slender, third joint unarmed; fifth with about five spines on inner margin and a few hairs.

*A. Edwardsii*, AUDOUIN, Explic. des Planches de la Descr. de l'Égypte, par M. Savigny, Crust., pl. 10, f. 1, p. 90.

*A. monopodium* (?), Bosc, Crust., ii. pl. 13, f. 2, and p. 73.

Var. *leviusculus*.—Plate 34, fig. 3 *a, b, c, d, e, f*, represent parts of a specimen of the same or an allied species from Wakes Island, north Pacific. The front, antennæ, and legs are nearly as in the *Edwardsii*. The second basal joint of the inner antennæ is, however, but little longer than the first; the large hand is proportionally narrower, but this is often a varying character in the same species; the third and fourth pairs of legs are more nearly naked. The first joint of the carpus is hardly as long as the second and third. The differences are so small that we doubt with regard to the species being distinct from the *Edwardsii*. It is near the *A. 2-incisus* of De Haan (Faun. Japon., p. 179, pl. 45, f. 3), which De Haan considers a variety of the *A. avarus* of Fabricius. But in De Haan's figure, the base of the outer antennæ is not longer than the basal scale, and the rostrum is trigonal between the eyes, with a flat surface and concave sides.

#### ALPHEUS STRENUUS.

*Rostrum elongatum, acutum, superficie inter oculos leviter carinatâ. Squama antennarum externarum basalis basi non longior. Articulus antennarum internarum 2dus 1mo fere duplo longior. Pedes antici multo inæqui, manus majoris sinu infero-marginali concavo et non triangulato, brachio ad apicem internum acute uni-dentato; manu minore angusto-oblongâ, paulo pubescente, digitis intus dense hirsutis,*



*pilis apicem digiti mobilis omnino celantibus. Pedes 2di 3tiis multo longiores, carpi articulis 1mo 2doque fere æquis, 2do longiore quam 5tus.*

Beak long and acute, the surface between the eyes slightly carinate. Basal scale of outer antennæ not longer than base; second joint of inner antennæ nearly twice as long as first joint. Anterior feet very unequal, *larger* hand nearly as in *A. Edwardsii*, the excavation in inferior margin concave, and not triangular, arm having an acute tooth or spine at inner apex; *smaller* hand narrow oblong, somewhat pubescent, fingers densely hirsute within, hairs covering wholly extremity of moveable finger. Second pair of feet much longer than third, carpus having the first and second joints nearly equal, and second longer than fifth.

Plate 34, fig. 4 *a*, front and base of antennæ, enlarged two diameters; *b*, large hand (left); *c*, smaller hand; *d*, part of second pair of feet; *e*, part of third pair.

Island of Tongatabu, Pacific Ocean.

Length of body, one and three-fourths inches. Colour, dull olive green; legs, bright yellow. The hairs of inner edge of fingers of smaller hand are dense; they become super-marginal gradually and meet from either side on the upper surface of the upper finger, some little distance from the apex. The fingers of the larger hand are a little pubescent. The hand of the second pair of feet has a few short divaricate hairs. The tooth at base of inner antennæ extends to apex of first joint. The fifth joint of the third and fourth pairs of feet has about six sets of spinules on inner margin. The outer surface of the larger hand is uneven, very nearly as in the *Edwardsii*.

#### ALPHEUS PACIFICUS.

*Rostrum breve, acutum, superficie inter oculos breviter carinatâ. Squama antennarum externarum basalis basi planè brevior; articulus antennarum internarum 2dus 1mo duplo longior. Pedes antici multo inæqui; manus majoris sinu infero-marginali profundè triangulato,*

*brachio apicem internum inermi; manu minore angusto-oblongâ, paulo pubescente, digitis intus dense hirsutis, apicibus supernè non tectis. Pedes 2di 3tiis parce longiores, carpi articulo 2do multo breviorè quam 1mus, vix longiorè quam 5tus.*

Beak short, acute, surface between the eyes slightly carinate. Basal scale of outer antennæ shorter than base of same; second joint of inner antennæ twice as long as first joint. Anterior feet very unequal; *larger* hand as in *A. Edwardsii*, the sinus of lower margin deep triangular, arm unarmed at inner apex and elsewhere; *smaller* hand narrow oblong, a little pubescent, fingers densely hirsute within, upper surface of extremity not covered. Second pair of feet but little longer than third, second joint of carpus much shorter than first, and little longer than fifth.

Plate 34, fig. 5 *a*, front and base of antennæ; *b*, side view of front; *c*, part of outer maxilliped; *d*, *e*, hands; *f*, part of foot of second pair; *g*, part of foot of third or fourth pair.

Sandwich Islands.

Length of body, one and three-fourths inches. This species differs from the *A. strenuus* in having the notch on the lower margin of larger hand abrupt triangular, the tips of the fingers of the smaller hand not at all concealed by hairs, the arm without a tooth at inner apex, the base of outer antennæ longer than scale, second pair of feet much shorter proportionally, with the second joint of carpus much shorter than first. The general form of the larger hand, the uneven surface, and the shape of the fingers, are much as in the *strenuus*. The third and fourth joints of the carpus of the second pair of feet are together hardly as long as the second, and about equal to the fifth joint; the first equals the second, third, and fourth together; the hand is as long as the fourth and fifth joints.

*b.* Orbitæ margo spinulâ armatus.

#### ALPHEUS EUCHIRUS.

*Rostrum paulo elongatum, superficie inter oculos carinatâ. Squama*



*antennarum externarum basalis basi non longior. Articulus antennarum internarum 2dus 1mo paulo longior. Pedes antici multo inæqui; manus majoris sinu infero-marginali concavo; brachio apicem non spinigero; manu minore oblongâ, crassiusculâ, lævi, digitis extus et intus leviter laxèque pubescentibus. Pedes 2di 3tiis paulo longiores, carpi articulo 1mo duplo longiore quam 2dus, manu vix brevior quam tres articuli precedentes simul sumti. Pedes 3tii 4tive parce criniti, articulo 3tio apicem internum brevissime acuto, 5to intus 7-8-setuloso.*

Beak a little elongated, acute, surface between the eyes carinate. Basal scale of outer antennæ not longer than base of same. Second joint of inner antennæ a little longer than first joint. Anterior feet very unequal; sinus of lower margin of larger hand concave, arm not spinigerous at apex; smaller hand oblong, a little stout, smooth, fingers light pubescent without and within. Second pair of feet a little longer than the third, first joint of carpus twice as long as second, hand hardly shorter than the three preceding joints together. Feet of third or fourth pair sparingly hairy, third joint very short acute at inner apex, fifth with seven or eight sets of spinules on inner margin.

Plate 34, fig. 6 *a*, profile view of front and base of antennæ, much enlarged; *b*, part of outer maxillipeds; *c*, larger hand (the right); *d*, smaller hand; *e*, part of leg of second pair; *f*, part of third or fourth pair.

Straits of Balabac, north of Borneo.

Length of body, three-fourths of an inch. The fingers of the smaller hand are hardly as hairy on inner margin as on outer surface, and all the hairs are very slender. The larger hand is also thin pubescent, but especially on its inner surface and near upper surface. The lower surface is broadly rounded. The fingers are somewhat turned out of the plane of the hand.

2. *Manus margine inferiore integra. Dens antennarum internarum basalis articulo primo vix longior.*

a. *Orbitæ margo inermis.*

ALPHEUS OBESO-MANUS.

*Rostrum brevissimum, in carinam paulo postice productum. Squama antennarum externarum basalis basi non brevior, basi internarum multo brevior; dens internarum basalis perbrevis; articulus 2dus 1mo plus duplo longior. Pedes antici valde inæqui, manu majore lævi, elongatâ, obesâ, non compressâ, versus apicem angustiore, digito mobili perbrevi, malleiformi, minore lineari, digitis brevissimis. Pedes 2di portentosè elongati, 3tiis plus duplo longiores, carpi articulo 1mo quadruplo brevior quam 2dus, 3tio 4to 5toque brevibus, subæquis. Articulus pedis 3tii 3tius apice inferiore acutus.*

Beak very short, continued in a carina for a short distance along the back. Basal scale of outer antennæ not shorter than their base, considerably shorter than base of inner antennæ; basal tooth of inner antennæ very short, second joint more than twice as long as first. Anterior feet very unequal; larger hand smooth, elongate, rotund-obese, not compressed, narrowing towards apex, moveable finger very short, mallet-shape; smaller hand linear, fingers very short. Feet of second pair exceedingly long, more than twice as long as third, first joint of carpus one-fourth the length of second, third, fourth, and fifth short, nearly equal. Third joint of third or fourth pair of legs, acute at lower apex.

Plate 34, fig. 7 *a*, front, enlarged; *b*, part of outer maxilliped; *c*, larger hand (left); *d*, smaller hand; *e*, leg of second pair; *f*, part of third or fourth pair.

Feejee Archipelago.

Length, three-fourths of an inch. Second joint of inner antennæ full one and a half times as long as the first, and basal scale of outer pair hardly reaching beyond its apex. Larger hand without carinæ, tubercles, or furrows. Fingers of hands very short, those of smaller hand hardly exceeding one-fourth the hand in length. Fifth joint of



carpus of second pair somewhat longer than third or fourth; hand nearly as long as third, fourth, and fifth together, and naked; second joint longer than third, fourth, fifth, and hand; fifth pair of legs very slender, compared with the fourth. Tarsus of third and fourth pairs slender. The very great length of the feet of the second pair is a striking peculiarity of the species.

ALPHEUS CRINITUS.

*Rostrum acutum, superficie inter oculos carinatâ. Squama antenarum externarum basalis basi harum parce brevior, basi internarum paulo brevior; dens internarum basalis perbrevis. Articulus antenarum internarum 2dus 1mo duplo longior. Pedes antici multo inæqui; manu majore obesâ, parce compressâ, infra rotundatâ, omnino lævi, partim leviter pubescenti, digitis perbrevibus (manu quadruplo brevioribus), digito mobili arcuato; minore oblongâ, leviter crinitâ, digitis parte manus ante digitos paulo brevioribus. Pedes 2di valde elongati, 3tiis sesqui longiores, articulo carpi 2do parce longiore quam 1mus, 3tio 4to 5tove oblongo, his inter se longitudine æquis. Pedes 3tii 4tive leviter criniti, articulo 3tio apicem inferiorem dentigero.*

Beak acute, prolonged into a carina between the eyes. Basal scale of outer antennæ hardly shorter than base, somewhat shorter than base of inner antennæ; second joint of inner antennæ twice as long as first; basal tooth of inner very short. Anterior feet very unequal; larger hand obese, sparingly compressed, rounded below, wholly smooth, in part light pubescent, fingers very short (one-fourth as long as hand), moveable finger arcuate; smaller hand oblong, light crinite, fingers little shorter than part of hand preceding fingers. Feet of second pair very long, one and a half times as long as third pair, second joint of carpus a little longer than first, third, fourth, fifth each oblong, nearly equal; feet of third and fourth pairs light crinite, third joint having a tooth at lower apex.

Plate 34, fig. 8 *a*, front much enlarged; *b*, part of outer maxillipeds; *c*, large hand (left); *d*, smaller hand; *e*, part of foot of second pair; *f*, leg of third or fourth pair.

Balabac Straits.

Length of body, ten lines. Large hand largest in its basal half, and diminishing a little towards apex, at lower margin as well as elsewhere broadly rounded. The apex above the articulation of the moveable finger nearly in same line with the upper margin of the finger; carpus transverse; arm with lower apex very short acute. Carpus of second pair of feet has second joint as long nearly as third, fourth and fifth together; the hand is rather shorter than the fourth and fifth. The fifth joint of the third or fourth pair of legs has about four sets of spinules on inner margin.

## ALPHEUS MITIS.

*Rostrum acutum, superficie inter oculos carinatâ. Squama antennarum externarum basalis basi harum internarumve parce longior. Articulus antennarum internarum 2dus 1mo paulo longior, densque basalis articulo 1mo fere longior. Pedes antici inæqui; manu majore lævi, paulo compressâ, marginibus rotundatâ, digitis regularibus, manu fere triplo brevioribus; manu minore simili, angustiore. Pedes 2di 3tiis multo longiores, articulo carpi 2do 1mum longitudine æquante, 3tio 4tove oblongo, parce brevioribus quam 5tus, manu perbrevis. Pedes 3tii 4tique fere nudi, articulo 3tio apicem internum non acuto.*

Beak acute, surface between the eyes carinate. Basal scale of outer antennæ rather longer than base of outer or inner antennæ. Second joint of inner antennæ a little longer than first, basal tooth hardly longer than first joint. Anterior feet unequal; larger hand smooth, a little compressed, margins rounded, fingers regular, one-third as long as hand; smaller hand like the larger, but narrower in proportion. Feet of second pair much longer than third; first and second joints of carpus equal, third and fourth oblong, sparingly shorter than fifth, hand very short. Feet of third and fourth pairs nearly naked, third joint not acute at inner apex.

Plate 35, fig. 1 *a*, front, enlarged eight diameters; *b*, extremity of outer maxillipeds; *c*, larger hand; *d*, smaller; *e*, part of leg of second pair; *f*, part of leg of third pair.

Balabac Straits, East Indies.



Length, nine lines. Scale or tooth at the outer side of base of inner antennæ very slightly longer than the first joint. Hands without costæ or any unevenness of surface. Legs of second pair about one-third longer than third. The third joint of the third and fourth pairs rather narrow, and all the joints with very few hairs.

*b.* Orbitæ margo spinulâ denteve armatus.

ALPHEUS ACUTO-FEMORATUS.

*Rostrum acutum, postice in superficiem inter oculos productum. Squama antennarum externarum basalis basibus antennarum non longior. Dens basalis antennarum internarum brevis, articulus 2dus 1mo parce longior. Orbitæ margo acutus sed spinâ non productus. Pedes 2di 3tiis sat longiores, carpi articulo 1mo brevi, 2do plus duplo longiore quam 1mus. Pedes 3ti 4tiq. crassiusculi, articulo 2do 3tioque apicem inferiorem instar spinæ elongate acuto.*

Beak acute, surface between the eyes carinate. Basal scale of outer antennæ not longer than base of either pair of antennæ. Basal tooth of inner antennæ short, second joint hardly longer than first. Margin of orbit acute, but hardly produced into a spine. Feet of second pair considerably longer than third; first joint of carpus short, second more than twice as long as first. Third and fourth pairs of feet rather stout, second and third joints having the lower apex produced into a rather long spine.

Plate 35, fig. 2 *a*, front, much enlarged; *b*, part of outer maxilliped; *c*, part of front of second pair; *d*, *ibid.* of third or fourth pairs; *e*, *ibid.* of fifth pair.

Balabac Straits.

Length, nine lines. The hands of the specimen are gone, and we are not sure that the species should not be in the preceding division, although its general characters are more like those in which the lower margin of the hand is straight. It is peculiar in having a spine at the apex of both the second and third joints of the third and fourth

pairs of legs. The fifth pair of legs is much narrower than the fourth.

B. Articulus antennarum externarum 1mus spinâ externâ armatus.

a. Orbitæ margo inermis.

ALPHEUS PARVI-ROSTRIS.

*Corpus nudum. Rostrum acutum, breve, superficie inter oculos carinatâ. Squama antennarum externarum basalis basi utroque paulo longior; spina basalis mediocris; dens internarum basalis brevis; articulus 2dus 1mo vix longior. Pedes antici valde inæqui, manu majore crassissimâ, marginibus ambobus indentatâ, superficie externâ partim sulcatâ, digitis perbrevis, digito mobili extus arcuato; manu minore regulari, pubescente. Pedes 2di 3tiis paulo longiores, articulo carpi 1mo fere duplo longiore quam 2dus, manu brevi. Pedes 3ti 4tique crassiusculi, articulo 3tio apicem inferiorem unidentato.*

Body naked. Beak acute, short, surface between the eyes carinate. Basal scale of outer antennæ rather longer than base of either pair. Basal spine moderately long; basal tooth of inner pair short, second joint hardly longer than first. Feet of first pair very unequal, larger hand very stout, both margins indented, outer surface having a sulcus, fingers very short, the moveable one arcuate in outer margin; smaller hand regular, with some long pubescence. Feet of second pair but little longer than third, first joint of carpus twice as long as second, hand short. Third and fourth pairs of feet rather stout, third joint unidentate at inferior apex.

Plate 35, fig. 3 *a*, side view of front, much enlarged; *b*, part of outer maxilliped; *c*, larger hand, enlarged; *d*, smaller hand; *e*, part of leg of second pair; *f*, part of leg of third pair.

Straits of Balabac, north of Borneo.

Length of body, eight lines. The beak rises from the frontal margin and is short and acute. The carpus of the second pair of feet has the



first joint rather longer than the second and third; the hand is hardly as long as the fourth and fifth. The smaller hand is oblong, smooth, with terete fingers. Some long pubescence on the third and fourth pairs of legs.

♂. Orbitæ margo spinulâ dentevæ armatus rostro vix brevior.

#### ALPHEUS TRIDENTULATUS.

*Rostrum perbreve, dentiforme. Squama antennarum externarum basalis basi brevior, basi internarum vix brevior, spina externarum basalis mediocris, spina internarum longissima, articulo 1mo multo longior; articulus 2dus 1mo non longior. Pedes antici valde inæqui, manu majore lævi, paulo compressâ, marginibus latè rotundatâ, digitis perbrevibus, manu triplo brevioribus. Pedes 2di 3tiis paulo longiores, articulo carpi 1mo quadruplo longiore quam 2dus, 2do perbrevi, vix longiore quam 3tius. Articulus pedum 3tiorum 4torumve 3tius apice interno inermis.*

Beak very short, dentiform. Basal scale of outer antennæ shorter than base, as long as base of inner pair; basal spine of outer pair of moderate length; of inner very long (much longer than first joint), second joint of this pair not longer than first joint. Anterior feet very unequal, larger hand smooth, but little compressed, margins broadly rounded, fingers very short (not one-third as long as hand). Feet of second pair but little longer than third, first joint of carpus full four times as long as second, second, third, fourth all very short and nearly equal. Third joint of feet of third or fourth pair unarmed at inner apex.

Plate 35, fig. 4 *a*, front, enlarged four diameters; *b*, part of outer maxillipeds; *c*, larger hand, enlarged two diameters; *d*, smaller, *ibid.*; *e*, part of leg of third pair, *ibid.*

Rio Janeiro?

Length of body, ten lines. The three teeth of the front are very low and equal. The basal spine of the inner antennæ is two-thirds as

long as the base of the antennæ. The outer maxillipeds are nearly naked, and terminate in a cluster of spinules or short setæ. The smaller hand is quite small and rather short; fingers about half whole length of hand. The second joint of carpus of second pair of feet is slightly longer than the third or fourth, either of which is about as broad as long; the large hand is as long very nearly as the third, fourth and fifth joints together, and is but little shorter than the first; it bears some dense tufts of short hairs, especially on the under margin.

## ALPHEUS NEPTUNUS.

*Frons elongate trispinosus, rostro spinisque orbitalibus prælongis, æquis. Squama antennarum externarum basalis basi brevior et spina externa elongata; spina internarum basalis longa, articulo 2do brevior quam 1mus. Pedes antici multo inæqui, manu majore lævi, paulo compressâ, marginibus rotundatâ, digitis brevibus, manu triplo brevioribus, digito mobili supra arcuato; manu minore angustâ. Pedes 2di 3tiis longiores, articulo carpi 1mo quadruplo longiore quam 2dus, 2do 3tio 4toque inter se fere æquis, non oblongis. Articulus pedum sequentium 3tius apice inferiore inermis.*

Front with three long spines, the beak and orbital spines being quite long and equal. Basal scale of outer antennæ shorter than base, and outer spine elongate; basal spine of inner antennæ long, second joint shorter than first. Anterior feet very unequal; larger hand smooth, slightly compressed, margins rounded, entire, fingers short, one-third as long as hand, moveable one arcuate above; smaller hand narrow. Feet of second pair longer than third, first joint of carpus about four times as long as second, the second, third, and fourth equal, not oblong. Third joint of following feet unarmed at lower apex.

Plate 35, fig. 5 *a*, front, enlarged six diameters; *b*, larger hand, enlarged six diameters; *c*, moveable finger, thrown back; *d*, smaller hand, enlarged six diameters; *e*, part of leg of second pair; *f*, *ibid.* of third pair.

Sooloo Sea at six and a half and nine fathoms; also, Feejee Islands.



Length, 8-9 lines. Basal spine of inner antennæ a little longer than first joint, and extending about as far forward as apex of spine of outer antennæ, and half way to apex of basal scale of outer pair. The beak is about two-thirds as long as first joint of inner antennæ. The outer maxilliped has the last joint short pubescent with short hairs at apex. The smaller hand is oblong, nearly linear. The fingers of larger hand are out of plane of hand. The hand of the second pair is as long as the third, fourth, and fifth joints of the carpus. Fifth joint of third or fourth pair quite long, more than twice as long as fourth joint, seven or eight sets of spinules below; third joint somewhat pubescent.

II. ROSTRUM INTER OCULORUM BASES ORTUM, SULCO PROFUNDO IN CARAPACE  
UTRINQUE EXCAVATO.

a. Orbitæ margo inermis.

ALPHEUS PUGNAX.

*Rostrum acutum, anguste triangulatum, planum, inter oculorum bases ortum. Spina antennarum externarum basalis parva; squama basi paulo longior. Spina antennarum internarum basalis articulo 1mo non brevior, articulus 2dus brevis, 3tius squamam externarum non superans. Pedes antici inæqui; manu majore elongatâ, lævi, marginibus rotundatâ, supra angustè emarginatâ, digitis brevibus (manu triplo brevioribus), brachio apicibus instar spinæ acuto. Pedes 2di longi, articulo carpi 1mo dimidio brevior quam 2dus. Pedes 3tii 4tique graciles, articulo 3tio apicem inferiorem unidentato.*

Beak acute, narrow triangular, flat above, arising from between the bases of the eyes. Basal spine of outer antennæ small, basal scale longer than base. Base of inner antennæ shorter than scale of outer; basal spine of inner antennæ not shorter than the first joint, second joint short. Anterior feet unequal; larger hand long, smooth with rounded margins, narrow emarginate above near articulation, fingers short (about one-third the length of hand), arm having a spine at both outer and inner apex. Feet of second pair long, first joint short, hardly half the second in length. Third and fourth pairs slender, third joint with an acute tooth at lower apex.

Plate 35, fig. 6 *a*, side view of front, much enlarged; *b*, upper view of front; *c*, outer maxilliped; *d*, *e*, larger hand in different positions; *f*, smaller hand; *g*, part of leg of second pair; *h*, part of leg of third pair.

At Lahaina, Island of Maui, Hawaiian Group.

Length, twelve lines. The beak from its base is very narrow triangular, with straight sides, and there is no carina prolonged down the back. Second joint of inner antennæ hardly longer than first. Larger hand partly pubescent, somewhat fusiform, but little compressed, the finger turned out of plane of hand; moveable finger short, thin above, with arcuate dorsal margin. First joint of carpus of second pair of feet less than half the second; third shorter than fourth; fifth longer than fourth; hand as long as fourth and fifth. The fifth joint of third pair of legs long, very much longer than fourth, about eight sets of spinules on its lower side, rather long hairy above.

#### ALPHEUS DIADEMA.

*Rostrum latum, apice triangulatum et acutum, inter oculorum bases ortum, lateribus concavis. Spina basalis antennarum omnium brevis; squama externarum basi utroque longior. Pedes 2di 3tiis parce longiores, articulo carpi 1mo paulo longiore quam 2dus vel 5tus, 3tio 4tove parce oblongo. Pedes 3tii 4tive 5tis valde crassiores, articulo 3tio apicem inferiorem unidentato.*

Beak broad, apex triangular and acute, arises from a broad base between the bases of the eyes, and has the margins much concave. Basal spine of either pair of antennæ short, scale of outer pair longer than base of either. Feet of second pair but little longer than third, first joint of carpus much longer than second or fifth, third or fourth sparingly oblong. Feet of third or fourth pair much stouter than fifth, third joint unidentate at lower apex.

Plate 35, fig. 7 *a*, front, much enlarged; *b*, profile of front; *c*, part of outer maxilliped; *d*, part of leg of second pair; *e*, part of leg of third pair.



At Lahaina, Island of Maui, Hawaiian Group.

Length of body, ten lines. Beak starts from a broad space back of eyes, and narrows rapidly with a curve, is nearly linear between the eyes, and in front equilaterally triangular. There is an appearance of an irregular crenulation, but it seems to be owing to the colour alone. Second joint of inner antennæ a little longer than first, nearly one and a half times. Carpus of second pair of feet has the third and fourth joints together about equal to second, and hand equal to fourth and fifth in length. The fourth and fifth joints of the third and fourth pairs are short hairy externally, and the fifth joint has about six sets of spinules on inner side. In a side view of the front there is a low angle to the orbit, but there is no proper tooth or spine.

There are two specimens of this species in the collections and neither has the hands.

♂. Orbitæ margo dente spinulâve armatus.

1. *Spina orbitalis rostro plane brevior.*

ALPHEUS LÆVIS, *Randall.*

*Rostrum acutum, spiniforme, inter oculorum bases ortum, lateribus fere rectis. Squama antennarum externarum basalis basi non brevior, basi internarum parce longior; spina basalis externarum mediocris, internarum valde elongata. Spina orbitalis perbrevis. Pedes antici paulo inæqui, manu majore lævi, compressâ, marginibus rotundatis, integris, digitis brevibus (manu plus triplo brevioribus); manu minore oblongâ, digitis manu plus duplo brevioribus. Pedes 2di 3tiis parce longiores, articulo carpi 1mo parce longiore quam 2dus, manus longitudinem æquante. Pedes 3tii parce criniti, articulo tertio apicem inferiorem non acuto, tarso lato et brevi.*

Beak acute, spiniform, arising from between the bases of the eyes, sides nearly straight. Basal scale of outer antennæ not shorter than base, a little longer than base of inner pair. Basal spine of outer pair of moderate length, of inner much elongate. Orbital spine very short. Anterior feet not very unequal, larger hand smooth, compressed, margins rounded, entire, smaller oblong, fingers

not half as long as hand. Second pair of feet but little longer than third, first joint of carpus slightly longer than second, and as long as hand. Third pair having lower apex of third joint not acute, tarsus broad and short.

Plate 35, fig. 8 *a*, front, enlarged three diameters; *b*, profile of front, *c*, part of outer maxillipeds; *d*, larger hand, two diameters; *e*, smaller hand, two and a half diameters; *f*, part of second pair of feet; *g*, part of third pair, enlarged two diameters; *h*, form of tarsus.

Sandwich Islands; also Feejees or Friendly Islands.

Length of body, one and one-fourth inches. Basal spine or tooth of inner antennæ longer than first joint; second joint nearly one and a half times the first. Tarsus not uncinatè. Carpus of second pair of feet with all the joints rather short, third and fourth joints very short, as long together as second or fifth.

*Alpheus lævis*, DR. J. W. RANDALL, Jour. Acad. Nat. Sci. Philad., viii. p. 141.

#### ALPHEUS MALLEATOR.

*Rostrum perbreve, triangulatum, inter oculorum bases ortum. Spina orbitalis brevis. Squama antennarum externarum basalis basi brevior; spina basalis externarum mediocris, internarum brevissima; articulus 2dus internarum 1mo sesqui longior. Pedes antici inæqui; manus majoris superficiebus supernâ et internâ partim minutè tuberculatis, margine superiore sulcato, juxta articulationem digiti 2-3-inciso, digitis perbrevibus, mobili malleiformi, obtuso. Pedes 2di 3tiis parce longiores, articulo carpi 1mo duplo longiore quam 2dus. Pedes 3tii crassiusculi, articulo 3tio apicem inferiorem obtuso.*

Beak short triangular, arising from between bases of eyes. Orbital spine short. Basal scale of outer antennæ shorter than base; basal spine of outer antennæ of moderate length, of inner antennæ very short; second joint of inner pair one and a half times as long as first. Anterior feet unequal; upper and inner surface of larger hand partly minute tuberculate, upper margin sulcate and next to the articulation 2-3 incised, lower rounded, fingers very short, the



upper mallet-shape, obtuse. Feet of second pair a little longer than third, first joint of carpus about twice as long as second. Third pair of feet rather stout, third joint obtuse at lower apex.

Plate 35, fig. 9 *a*, cephalothorax, natural size; *b*, profile of front, enlarged four diameters; *b*, upper view of front, enlarged; *c*, caudal segment and appendages; *d*, larger hand outer surface, natural size; *e*, same, inner surface (from a larger specimen); *f*, smaller hand; *g*, second pair, natural size; *h*, outer maxillipeds, enlarged.

#### Rio Janeiro?

Length, two and a half inches. Second joint of inner antennæ nearly twice the length of first; basal spine or tooth of inner antennæ shorter than first joint. Larger hand with lower margin entire, a sulcus in outer surface of lower finger extending along hand, inner surface of hand towards upper margin rough with small tubercles, and somewhat hirsute. Smaller hand rather stout. Carpus of second pair has first joint equal to twice the second, or nearly to the second, third, and fourth together; hand rather longer than fifth joint.

The species is probably from Rio Janeiro.

#### GENUS BETÆUS, Dana.

*Alpheo oculis antennis pedibusque affinis. Frons non rostratum. Manus anticæ plus minusve inversæ, digito mobili inferiore vel exteriore.*

Like *Alpheus* in the eyes, antennæ, and feet. Front without a beak. Anterior hands more or less inverted, the moveable finger being the lower or outer.

The front has no trace of a tooth in the species observed, but is sometimes deeply notched at middle. In each of our species, the carpus of the second pair of feet has the first joint two or three times as long as the second joint, and the second, third, and fourth joints are very short and nearly equal. The hands are moderately large, and either equal or unequal.

## BETÆUS TRUNCATUS.

*Frons truncatus, medio non emarginatus. Squama antennarum externarum basi non longior; spina externa brevis; spina internarum basalis prælonga, articuli basales elongati, subæqui. Pedes antici multo inæqui, manu majore longâ, sublineari, valde compressâ, fere lævi, scabriculâ, digitis longis, fere dimidii manus longitudine, mobili terete. Pedes 2di 3tiis sat longiores, carpo sat brevi, articulo carpi 1mo plus duplo longiore quam 2dus, 2do 3tio 4toque brevibus. Articululus pedum sequentium 3tius omnino inermis.*

Front truncate, not at all emarginate at middle. Basal scale of outer antennæ about as long as base of either pair; outer spine short; basal spine of inner pair very long, basal joints elongate, subequal. Anterior feet much unequal, larger hand long, nearly linear, much compressed, minutely scabrous but nearly smooth, fingers long, hardly as long as half the hand, the upper terete; smaller hand linear. Feet of second pair longer than third, carpus rather short, first joint of carpus more than twice as long as second, second, third, and fourth all short. Third joint of the following legs wholly unarmed.

Plate 35, fig. 10 *a*, animal, enlarged two diameters; *b*, upper view of front; *c*, smaller hand.

Hermite Island, Fuegia, where it was dredged up in ten fathoms water, Jan. 27, 1839.—Lieut. Case.

Length, fifteen lines. Last joint of outer maxillipeds rather densely pubescent, hairs not half as long as joint. All legs slender; carpus and hand of second pair hardly longer than fourth, fifth, and sixth joints of third pair, fourth joint of carpus shortest, third joint not shorter than second. The three joints of the base of the inner antennæ are unusually long, and the second is a little the longest. The lower margin of the hand is subtrenchant, and fine scabrous; margins of the arm also minutely scabrous.



## BETÆUS ÆQUIMANUS.

*Frons medio profundè incisus. Squama antennarum externarum basalis basi paulo brevior; spina externa perbrevis; spina internarum basalis prælonga, articulo 2do multo brevior quam primus. Pedes antici æqui, manu lævi, compressâ, digitis perbrevibus. Pedes 2di 3tiis sat longiores, articulo carpi 1mo plus duplo longiore quam 2dus, 2do 3tio 4toque perbrevibus. Articulus pedum sequentium 3tius omnino inermis.*

Front with a deep emargination in place of beak. Basal scale of outer antennæ a little shorter than base, outer spine very short; basal spine of inner pair very long, second joint much shorter than first. Anterior feet equal, hand smooth, compressed, fingers very short. Feet of second pair longer than third, first joint of carpus more than twice as long as second, second, third, and fourth, very short. Third joint of following feet wholly unarmed.

Plate 35, fig. 11 *a*, body, enlarged four diameters; *b*, upper view of front.

Along shores of Black Rocks, among sea-weeds, Bay of Islands, New Zealand.

Basal spine of inner antennæ extends nearly to apex of second joint. The hands are so turned over, when in their natural position, that the moveable finger is below; this finger is about one-third as long as hand, and arcuate above. The hand of the second pair is fully as long as three preceding joints.

## BETÆUS SCABRO-DIGITUS.

*Frons leviter arcuatus, medio obsolete excavatus. Squama antennarum externarum basalis mediocris, basi parce brevior, basin internarum fere æquans; flagellum latè compressum; spina externa brevis; spina internarum basalis longa. Pedes antici feminae valde inæqui, manu*

*majore mediocri, leviusculâ, compressâ, margine inferiore rotundato, digitis scabriculis, dimidio manus paulo brevioribus, vix dentigeris; maris æqui, crassiores, digitis brevibus, valde incurvatis, immobili crassè unidentato. Pedes 2di 3tiis paulo longiores, articulo carpi 1mo plus duplo longiore quam 2dus, 2do 3tio 4toque brevibus. Articulus pedum sequentium 3tius extus prope basin spinâ armatus.*

Front slightly arcuate, at middle obsoletely excavate. Basal scale of outer antennæ of moderate size, a little shorter than base, and as long as base of inner pair; flagellum broad compressed, outer spine short; basal spine of inner antennæ long. Anterior feet of *female* very unequal, larger hand of moderate size, nearly smooth, compressed, inferior margin rounded, fingers scabriculate, nearly half as long as hand, without distinct teeth; of *male* equal, stout, fingers short and much incurved, the immoveable one with a large tooth. Feet of second pair little longer than third, first joint of carpus more than twice as long as second, second, third, and fourth short. Third joint of following feet on outside, near its base bearing a spine.

Plate 35, fig. 12*a*, front of female, magnified two diameters; *b*, caudal segment; *c*, outer maxilliped, *ibid.*; *d*, larger hand, *ibid.*; *e*, part of second pair, *ibid.*; *f*, part of third or fourth pair, *ibid.*

Valparaiso, Chili.

Length of body, one and a half inches. This species is near the *Alpheus emarginatus* of Edwards, but has a short spine to base of outer antennæ. The second joint of the inner antennæ is rather longer than the first. The basal spine of the inner pair extends very nearly to apex of second joint. The second joint of the carpus of the second pair of legs is hardly longer than the third, and the hand is about one-half of the length of the carpus. The male referred to this species is like the other specimens in form, front, antennæ, eight posterior legs; but differs in the hands, which have the moveable finger very much incurved, with two teeth on the basal half of its inner margin; and the tooth of the other finger is a long low triangle, with the hypotenuse on the upper side, which side is nearly flat. The outer maxillipeds are narrow, and the hairs are throughout quite short.



## GENUS HIPPOLYTE.

1. *Rostrum super carapacis dorsum non productum.*HIPPOLYTE ENSIFERUS (*Edwards*).

Gulf-weed, Atlantic, latitude, 36°–39° north; longitude, 71°–44° west.

The beak in the specimens seen by us, has either three or five teeth at apex, the middle one longest, and the outer next longest. Length, three-fourths to one inch. Colour, brownish yellow, with spots of cerulean blue. Legs transparent; excepting first pair and maxillipeds, which are brownish yellow like the body. Tarsus spinulous on inner margin.

*H. ensiferus*, EDWARDS, Crustacés, ii. 374; GOODSIR, Ann. Mag. Nat. Hist., 1845, xv. 74; KRAUSS, S. Af. Crust., p. 56.

## HIPPOLYTE ACUMINATUS.

*Rostrum elongatè acuminatum, subensiforme, apice parce recurvatum, squamá antennali non brevius, medio margine supra infraque unidentato. Carapax supra oculum unispinosus. Antennarum flagellum brevius internarum 5–6-articulatum, apicem rostri non superans. Pedes antici perbreves, manu ovatá. Pedes 2di 3tiis breviores, carpo 3-articulato. Maxillipedes externi basin antennarum externarum superantes, pubescentes. Tarsi pedum 6 posticorum infra spinulosi.*

Beak long, acuminate, subensiform, sparingly curved upward at extremity, not shorter than basal scale of outer antennæ, near middle of upper and lower margin one-toothed. Carapax having a spine above the eye, shorter flagellum of inner antennæ five or six-jointed, not reaching beyond apex of beak. Anterior feet very short, hand ovate. Second pair shorter than third, carpus three-

jointed. Outer maxillipeds reaching beyond apex of base of outer antennæ, pubescent. Tarsi of six posterior feet spinulous below.

Plate 36, fig. 1 *a*, part of animal, enlarged; *b*, inner antennæ; *c*, hand of first pair; *d*, leg of second pair; *e*, part of leg of third pair.

From Gulf-weed (*Sargassum natans*) in the Atlantic, latitude, 36° 07'; longitude, 71° 36', August 24, 1838; also, latitude, 38° 12' north; longitude, 44° 44' west, September 2, 1838; also, latitude, 4° 07' north; longitude, 20° 43' west.

Length of body, nine to twelve lines. Colour, yellow, with orange dots; sometimes a dirty yellow; at base of thorax and in fifth joint of abdomen translucent. Inner antennæ with first joint one-third as long as beak, and having an appressed tooth on outer margin; longer flagellum twelve to fourteen-jointed, and a few short hairs at apex of each joint. Second pair of feet one-third longer than first pair; hand hardly longer than carpus. Scattered tufts of short hairs on joints of six posterior legs. Caudal segment with two pairs of spinules on outer surface. Some of the females had eggs under the abdomen.

Differs from the *tenuirostratus*, which is attributed by Edwards to the same localities in the Atlantic, in having no spine on the back over the stomach region, and but one tooth on lower margin of beak.

#### HIPPOLYTE EXILIROSTRATUS.

*Rostrum longum, omnino angustissimum, versus apicem non latior, rectum, apice acutum, supra 4-spinosum, infra rectum, integrum. Antennarum flagellum brevius internarum apicem rostri multum superans, multiarticulatum. Maxillipedes externi elongati, apicem basis antennarum externarum multum superantes. Pedes antici perbreves, manu subovatâ, fere per ejus latus carpo articulatâ. Pedes 2di 3tiis breviores, carpo 3-articulato; 6 sequentes nulliusculi, tarsis infra spinulosis, spinulis apicis longis, reliquis brevissimis.*

Beak long, throughout very narrow, and not broader towards apex, straight, acute at apex, above four-toothed, below straight and entire. Shorter flagellum of inner antennæ many-jointed, reaching



much beyond the beak. Outer maxillipeds elongate, extending much beyond apex of base of outer antennæ. Anterior feet very short, hand subovate, articulated with the carpus nearly by its side. Second pair of feet shorter than third, carpus eight-jointed. Six following feet nearly naked, tarsi below spinulose, spinules of apex long, the rest very short.

Plate 36, fig. 2 *a*, animal, enlarged six diameters; *b*, hand of second pair, enlarged about seventy diameters; *c*, extremity of leg of third pair, enlarged; *d*, tarsus of same, enlarged seventy diameters.

Dredged in the harbour of Rio Janeiro.

Length of body, six to eight lines. The teeth of the beak are anterior to the line of the eyes. The straight lower margin of the beak is a peculiar characteristic. The fifth joint of the six posterior legs is a little the widest about one-fourth its length from the apex, and at the point of greatest width on inner margin, there is a spinule longer than others above or below; the tarsus closes against the oblique margin below this spinule. The hairs of the hand of second pair are minutely spinulose. Eyes long, and a spine on the carapax over the eye.

The closing of the tarsi against the preceding joint is more perfectly accomplished in this species, than in other species of Hippolyte, and it gives the legs an imperfect prehensile character.

#### HIPPOLYTE OBLIQU-MANUS.

*Rostrum longum, tenuiter laminatum, rectum, versus apicem verticaliter latius, infra 2-dentatum non rectum, supra 4-dentatum, apice bifidum. Flagellum antennarum internarum minus apicem rostri superans, majus paulo longius. Pedes antici perbreves, manu subovatâ, carpo manu multo brevioribus, vix oblongo. Pedes 2di 3tiis breviores, carpo 3-articulato. Tarsi pedum 6 sequentium infra spinulosi, spinulis apicis longis, deinde sensim brevioribus.*

Beak long, thin laminate, straight, towards apex broader, below not straight and two-toothed, above four-toothed, apex bifid. Smaller

flagellum of inner antennæ reaching beyond apex of beak, larger a little longer than the other. Anterior feet very short, hand subovate, carpus much shorter than hand, scarcely oblong. Feet of second pair shorter than third, carpus three-jointed. Tarsi of six following feet spinulous below, spinules of apex long, and thence gradually becoming shorter.

Plate 36, fig. 3 *a*, part of body, enlarged six diameters; *b*, part of leg of second pair, *ibid.*; *c*, hand of first pair, *ibid.*; *d*, hand of first pair, enlarged twenty-four diameters; *e*, extremity of leg of third pair; *f*, tarsus of same leg, enlarged seventy diameters.

Dredged in the harbour of Rio Janeiro, along with the *H. exilirostratus*.

Length, eight lines. The beak has an angle below, unlike that of the *exilirostratus*, and also, two teeth, besides a bifid apex. The tarsi of the six posterior legs are also different, in having longer spinules below; and the preceding joint is linear in outline, with pairs of spinules on the inner margin. The carpus of the first pair of legs is hardly longer than broad, and is articulated with the hand by the lower apex. Eyes long, and a spine on the carapax over each eye.

2. *Rostrum super carapacis dorsum productum.*

HIPPOLYTE GIBBOSUS, *Edwards.*

Plate 36, fig. 4 *a*, animal, natural size; *b*, beak; *c*, part of leg of first pair, enlarged; *d*, *ibid.* of second pair; *e*, under view of part of abdomen.

In Feejees, along shores of Viti Lebu; also, at the Sandwich Islands.

Length, two and one-fourth inches. Colour of a Feejee specimen, clouded with light verdigris-green and flesh-red, the tints delicate, but colours opaque; legs and antennæ, banded with olive-green and a paler greenish shade. Anterior legs very slender, the hand not



stouter than rest of leg, and fingers one-fourth the length of the hand. Second pair filiform, carpus ten-jointed, joints subequal.

In a specimen from the Paumotus, agreeing with this species in the teeth of the beak, and in its slender anterior feet, the general colour consists of areolets of a slate shade, bordered by a bright green, with a few small concentric circles of alternate slate and green. Only an imperfect figure was made when the specimen was collected, and in it the beak is not as much reflexed as in the *gibbosus*; yet as we have not the specimen to refer to, we cannot say that the species is different.

EDWARDS, Crust., ii. 378.

#### HIPPOLYTE BREVIROSTRIS.

*Rostrum breve (basi antennarum internarum multo brevius) acutum, spiniforme, dorso breviter productum, supra 4-spinosum, spinis inter se æque remotis. Maxillipedes externi longi, squamam antennalem longe superantes. Pedes antici crassiusculi, manu oblongâ. Pedes 2di 3tiis longiores, carpo elongato, 7-articulato.*

Beak short, very much shorter than base of inner antennæ, acute, spiniform, produced a short distance on the back, above four-spinous, spines equally spaced. Outer maxillipeds long, reaching far beyond scale of outer antennæ. Anterior feet stoutish, hand long. Feet of second pair longer than third, carpus elongate, seven-jointed.

Plate 36, fig. 5, animal, enlarged two diameters.

Dungeness, in Straits of De Fuca.

Length of body, one and one-fourth to one and a half inches. Of the spines of the beak two belong to the beak proper and two are on the cephalothorax. Below the eyes on anterior margin two spines, the lower quite small. Base of inner antennæ with a longish spine to outer side of basal joint, and one or two short spines at apex of other joints. Smaller flagellum short, and joints very numerous and

very short. Outer maxillipeds have some short spinules at apex, and on upper margin towards apex, but are not prominently hirsute or pubescent. Hand of first pair not shorter than carpus, linear, two or three times as thick as following pairs of legs. Six posterior legs nearly naked, penult joint quite long; tarsus spinulous within. Fourth and fifth joints of abdomen acute either side.

#### HIPPOLYTE LAMELLICORNIS.

*Rostrum longum verticaliter latissimum, fere ad thoracis basin productum, apice bifidum, supra sinuosum, super cephalothoracem 4-spinosum, anterius 6-spini-dentatum, spinulis inæquis, totis inter se subæque remotis; infra triangulatum, 2-dentatum. Antennæ internæ rostro parce longiores. Pedes antici gracillimi, 2dis paulo crassiores. Pedes 2di 3tiis vix breviores, carpo elongato, 7-articulato, articulo carpi 3tio longo. Tarsi pedum sequentium fere inermes, spinulis versus basin subtilissimis. Maxillipedes externi apice spinulosi, articulo ultimo supra pubescente.*

Beak long, broad lamellate, produced nearly to posterior margin of thorax, bifid at apex, undulate above, four spines upon cephalothorax, and about six upon proper beak, teeth or spines unequal, all nearly equally spaced; outline of beak below triangulately salient, two-dentate. Inner antennæ little longer than the beak. Anterior feet very slender, but little stouter than the next pair. Second pair hardly shorter than third, carpus elongate, seven-jointed, third joint quite long. Tarsi of following pairs nearly unarmed, a few very minute spinules towards base. Outer maxillipeds spinulous at apex, last joint pubescent above.

Plate 36, fig. 6 *a*, animal, natural size; *b*, extremity of outer maxillipeds, enlarged six diameters; *c*, carpus and hand of second pair, *ibid.*; *d*, part of third pair, *ibid.*

Dungeness, in the Straits of De Fuca, Northwest America.

Length of body, one and a half to two inches. The four dorsal spines are rather larger than those of the beak proper; and the first



and last of the latter (not counting the bifid tip), are much smaller than the others; the outline of the whole is separately arcuate along the back and along the beak, with a concave outline between the two parts. The naked tarsus is peculiar. The base of the inner antennæ is hardly as long as half the beak, and the flagella scarcely reach beyond the tip of the beak. The second and third joints of the abdomen have the lateral margin triangulate or obtusely pointed, and in the next two, this margin is acute. The third joint of the carpus of the second pair of feet is twice as long as the first and second joints together. The six posterior legs are nearly naked.

#### RHYNOCINETES TYPICUS.

Plate 36, fig. 7 *a*, female, natural size; *b*, beak of same; *c*, outer maxilliped of male, natural size; *d*, first pair of legs of male, natural size.

Valparaiso.

The species has been described with detail by Milne Edwards, and figured by him in the *Ann. des Sci. Nat.* [2], vii. pl. 4, and also in the *Voy. dans l'Amer. Merid.*, of Alcide d'Orbigny, *Crustacés*, pl. 17. The coloured drawing by the author, represents a fresh living specimen, and shows the usual colouring of life, while that in D'Orbigny's work, is much faded in its colours.

It is important to observe, that the exterior maxillipeds are very much more elongate in the male than in the female, being in the former as long as the body.

#### SUBFAMILY PANDALINÆ.

#### PANDALUS PUBESCENTULUS.

*Carapax dense brevissimeque pubescens, margine infra oculum bispinoso. Rostrum squamâ antennali longius, ensiforme, paulo recurvatum sed apice non altius quam dorsum, supra 16-18-dentatum, dentibus parvulis et fere ad dorsi medium continuatis, versus apicem edentulum,*

*infra 7-dentatum, apice bifidum. Pedes toti nudiusculi, 3tii 4ti 5tique longitudine sensim decrescentes, 3tii longi, 1mi articulis 2dorum tribus primis paulo longiores.*

Carapax densely very short pubescent, margin below the eye with two spines. Beak longer than basal scale of outer antennæ; ensiform, somewhat recurved, but apex not raised above level of back, sixteen to eighteen-toothed above, teeth small and continued nearly to middle of back, towards apex unarmed, apex bifid, below seven-toothed. Feet nearly naked, third, fourth, and fifth pair decreasing regularly in length, anterior pair but little longer than first three joints of second pair.

Plate 36, fig. 8, animal, natural size.

Straits of De Fuca, at Dungeness, Oregon.

Length of body, five inches; of carapax, two and one-fourth inches; of beak to the posterior tooth on the back, one and five-eighths inches; of beak to the orbital sinus, its proper base, one and one-fourth inches.

#### SUBFAMILY PALÆMONINÆ.

We have added several new genera to this subfamily; and they show the little importance of external form compared with certain other characteristics. In the two extremes of the group, *Pontonia* and *Palæmon*, we have a striking contrast in beak and body, the one depressed, with a short beak, the other compressed, with a long ensiform beak; in the former, the outer maxillipeds are suboperculiform, in the latter, slender throughout. The genus *Pontonia*, as adopted by Milne Edwards, embraces two genera; one, *Pontonia* proper, with small eyes, and living in the shells of living molluses; and the other, swimming free, and often found among the branches of a coral, where it had secreted itself. The latter (our *Ædipus*), has large eyes, with the outer maxillipeds equally broad throughout, and the tarsus having a high prominence below. Another group (*Harpilius*, as here adopted) has probably been included under *Pontonia*; but although near the last in general form, and having also an uncinatè tarsus, the promi-



nence on the under side of the tarsus is wanting, and the outer maxillipeds are peculiar, the second joint being broad, and the following narrow, as in the true *Pontonia*, but the latter two together longer than the second, unlike *Pontonia*.

In another genus (our *Anehistia*), differing but little from the preceding, the outer maxillipeds are slender throughout; the tarsus is also slender and nearly straight; the body is not depressed.

In all the groups which have been mentioned, the mandible is without a palpus, and the inner antennæ have but two flagella, although one of them is sometimes bifid at apex.

The next group (*Palæmonella*) is between the last mentioned and *Palæmon*. The form is that of *Palæmon*; the inner antennæ have two flagella, with one bifid at tip; the tarsi are slender; the mandibles have a rudimentary palpus of two joints. They pass into *Palæmon* through those species of the latter genus, which have two of the three flagella of the inner antennæ united nearly to their extremities.

From this survey of these genera and their relations, it is evident that *Pontonia* and *Palæmon* pertain to the same natural group, and both are removed by important characters from the *Alpheinæ*.

#### GENUS PONTONIA, *Latreille*.

*Corpus depressum. Oculi parvi. Maxillipedes externi sub-operculi-formes, articulo 2do latiusculo, latiore et longiore quam duo sequentes. Rostrum depressum, breve. Antennæ internæ flagellis duobus confectæ. Tarsi uncinati.*

Body depressed. Eyes small. Outer maxillipeds suboperculiform, second joint rather broad, broader and longer than the two following. Rostrum depressed, short. Inner antennæ ending in two short flagella. Tarsi unciniate.

The *Pontonia tyrrhena* is the type of this genus. We refer to this group another species, found, like that, within the shell of a bivalve mollusc. The shell is more opaque and thicker than in the *Pontonia macrophthalma* and allied; the legs are shorter; the eyes very much smaller; the outer maxillipeds very different; the tarsi destitute of

the protuberance below. In our species, but four branchiæ were counted on either side of the thorax; none were attached to the fifth pair of legs; the leaflets were long linear. The abdomen posteriorly, for the last three segments, is very narrow, the three anterior segments being very broad, and the fourth rapidly narrowing; the last three were flexed upon the venter, and filled up the space left between the sides of the preceding segments. Eyes quite small, and projecting only their diameters. Scales of the outer antennæ partly concealed beneath the front. Beak flat and short.

The single specimen of this species collected by us, was lost at the wreck of the Peacock. The drawings and descriptions were made from the living animal.

#### PONTONIA TRIDACNÆ.

*Corpus depressum. Carapax nudus, lævis, paulo oblongus, rostro triangulato, obtuso. Antennæ internæ perbreves, flagellis subæquis, articulis duobus precedentibus non oblongis. Squama antennarum externarum basalis apicem rostri non superans; flagellum rostro paulo longius. Pedes antici longiores, tenues, digito dimidio brevioribus quam manus; 2di crassiusculi, breves, subæqui, manu oblongâ, digitis manu plus dimidio brevioribus, brachio ultra carapacem parce saliente. Pedes 6 postici breves, æqui, nudi.*

Body much depressed. Carapax naked, smooth, a little oblong, broadest at middle; beak triangular, obtuse. Inner antennæ very short, flagella subequal, two joints next preceding not oblong. Scale of outer antennæ not reaching beyond apex of beak, flagellum a little longer than beak. Feet of anterior pair longest, slender, finger half as long as hand; second pair rather stout, short, subequal, hand oblong, fingers less than half the length of hand; arm but little salient beyond carapax. Six posterior feet about equal, naked.

Plate 37, fig. 1 *a*, animal, enlarged; *b*, under view of abdomen; *c*, under view of anterior part of cephalothorax, more enlarged; *d*, one of the branchial leaflets.



Found in a Tridacna, at Tutuila, one of the Samoan or Navigator Islands.

Length, one-third of an inch, the abdomen being inflexed; but, with the abdomen extended, nearly two-thirds of an inch.

Several of the characters of this species are given in the remarks on the genus. The sides of the carapax curve around below, and leave ventrally, between, a space about one-third the width of the thorax. Abdomen when inflexed reaches to base of thorax. Eggs were contained in the cavity formed beneath the inflexed abdomen.

Antero-lateral angle of scale of second antennæ acute. Base of same antennæ slender, last joint longer than preceding, flagellum shorter than base. The superior antennæ have a very stout base, excepting the last two joints, which are very short. Length of hand of first pair of legs about half that of carpus.

GENUS ÆDIPUS, Dana.

*Pontoniæ affinis. Corpus depressum. Oculi permagni, multo salientes. Maxillipedis externi articuli toti latiusculi, laminati, 3tio non angustiore quam 2dus, ultimo non brevior quam 2dus. Rostrum sive depressum, sive compressum et laminatum. Antennæ internæ flagellis duobus confectæ. Manus 2dæ sæpius permagnæ, longissimæ, subequæ. Tarsi uncinati, breves, processu crasso infra armati.*

Near *Pontonia*. Body depressed. Four anterior feet chelate, second pair the largest. Eyes quite large and much salient. Outer maxillipeds having all the joints equal, broad and laminate, third not narrower than second, and fourth or last not shorter than second. Beak either depressed or compressed and laminate. Hands of second pair of feet usually very large and long, subequal. Inner antennæ ending in two flagella.

The protuberance on the under side of the tarsus near its base, is one characteristic distinguishing this genus from Harpilius, and suggested the name of the genus, from οίδημα, a swelling, πους, foot. The outer maxillipeds are remarkable for the breadth of all the joints,

while the third and fourth are narrow in *Pontonia*. The eyes are peculiarly large and projecting.

The body is depressed nearly as in *Alpheus*, and the larger hands have often an *Alpheus*-like form, being large and oblong, with short fingers. In the known species they are equal in size. The basal scale of the outer antennæ is very broad.

The species swim free, and are not found within the shell of a living mollusc, like some (if not all) *Pontoniæ*. They have a thin shell, and are frequently rich and beautiful in their colours.

This genus includes the *Pontonia macrophthalma* of Edwards, *Crustacés*, ii. 359, and Cuvier's *Règne An. Illust.*, pl. 52, f. 3.

#### ÆDIPUS SUPERBUS.

*Corpus paulo depressum. Rostrum horizontaliter latum, oblongo-triangularatum, rectum, supernè medio carinatum et 5-dentatum, infra prope apicem 2-dentatum, squamâ basali antennarum externarum plus duplo brevius, basi internarum paulo brevius. Pedes antici tenues, manu breviter villosâ; proximi æqui, crassissimi, manu magnitudine portentosâ, plus dimidio longiore quam carapax, tumidâ, versus basin crassiore, digito mobili plus quadruplo breviorè quam manus, angusto. tenuiore quam immobilis, margine externo angulate sinuoso. Oculi magni.*

Body somewhat depressed. Beak horizontally broad, oblong-triangular, straight, carinate along middle, and five dentate above, below near apex two-dentate, not half as long as basal scale of outer antennæ, and a little shorter than base of inner antennæ. Two anterior feet slender, hand short villous in tufts. Second pair equal, very large and stout; hand more than half longer than carapax, inflated, largest towards base, moveable finger not a fourth as long as hand, narrow, more slender than other finger and angulato-sinuous on outer margin. Eyes large.

Plate 37, fig. 2 *a*, animal, enlarged three and a half diameters; *b*, extremity of caudal segment; *c*, second pair of maxillipeds; *d*, outer maxilliped; *e*, outline of tarsus; *f*, rostrum and outline of carapax.

Pacific, among the growing corals of Tongatabu.



Length, ten lines. Colour, mostly opaque white, with a bluish, yellowish, or flesh tinge; antennæ and scales, eyes, feet, and posterior part of body from the fourth abdominal segment, transparent wine-yellow, or burnt sienna, dotted with brown; extremity of caudal segment and lamellæ, purple. Beak acute and the margin either side in upper view slightly convex, then concave as it approaches the eyes, and over the base of the ocular peduncle there is a low angle. In profile the carapax a little longer than broad. Inner antennæ with the first joint very broad, and the outer apex triangular and acute; the two following joints quite short, not oblong, and the beak extending about to the apex of the second; exteriorly and from below the first joint, a long curving tooth arises, which extends forward exterior to the first joint, as far as base of second joint; second and third joints hairy within, shorter flagellum the stouter, and three-fourths as long as longer or inner; it is divided near apex; inner flagellum longer than carapax and hairy below. Second antennæ about as long as body; basal scale quite broad; a tooth below apex on outer side; apex projecting beyond the tooth, obtuse. Carpus of second feet short, obconical; apical margin in part acutely dentate. Penult abdominal segment acute on either side of base of caudal appendages. Caudal segment slightly shorter than adjoining lamella, at apex truncate and having six short spines, of which the second from either side is the longest.

#### ÆDIPUS GRAMINEUS.

*Corpus paulo depressum. Rostrum angustum, rectum, squamâ basali antennarum externarum fere dimidio brevius, basin internarum longitudine æquans, supra 4-dentatum, infra prope apicem 1-dentatum. Oculi magni. Pedes antici elongati, antennis internis non breviores. Pedes 2di æqui, crassissimi, manu magnitudine portentosâ, plus dimidio longiore quam carapax, inflatâ, versus basin crassiore, digito plus quadruplo brevior quam manus, sublunato, extus integro, arcuato.*

Body somewhat depressed. Rostrum narrow, straight, much shorter than basal scale of outer antennæ, and as long as base of inner,

above four serrate, below near apex one-serrate. Eyes large. Anterior feet long, not shorter than inner antennæ. Second feet very large, the hand of same size usually as in preceding, more than half longer than carapax, inflated, stouter towards base, finger hardly one-fourth the hand in length, sublunate, outer margin entire, thumb narrower, one-toothed within.

Plate 37, fig. 3 *a*, animal, enlarged three and one-half diameters; *b*, profile of beak; *c*, under view of carpus and extremity of arm; *d*, maxilliped of second pair; *e*, *ibid.* of third pair.

Pacific, on the coral reef, among growing coral at Rewa, Viti Lebu, one of the Feejee Islands.

Length, eight lines. Colour, grass-green, with many dark, irregular longitudinal lines along the carapax and abdominal segments. Beak much more slender than in the preceding, and the margin concave from the tip of the beak backward, and around below the eyes; in profile the beak is linear, the upper and under margins being very nearly parallel. Moveable finger of the large hand with the inner margin concave and the outer much more convex, and broadest at middle; lower finger less stout, and having a single notch in the inner margin. Carpus of the second feet and the preceding joint also, with one or two spiniform teeth on apical margin. Outer antennæ about as long as body.

#### GENUS HARPILIUS (*Dana*).

*Pontoniæ* (*Ædipoque affinis*). *Corpus sive depressum sive fere cylindricum. Oculi permagni, valde salientes. Maxillipedis externi articulus 2dus latus, 3tius 4tusque angusti, tenues, simul sumti 2do longiores, ultimo (4to) multo brevioribus quam precedens. Rostrum longum, compressum et laminatum. Antennæ internæ flagellis duobus confectæ. Manus 2dæ longæ sat tenues, æquales. Tarsi uncinati, breves, processu inferiore carentes.*

Near *Pontonia* and *Ædipus*. Body either depressed or nearly cylindrical. Eyes large and much salient. Outer maxillipeds with



second joint broad, the following slender, last much shorter than preceding. Beak long, compressed and laminate. Inner antennæ ending in two flagella. Hands of second pair long and rather slender, equal. Tarsi uncinatæ, short, but without a protuberance below.

The outer maxillipeds have the form nearly of those of *Pontonia*, yet the last two joints are much longer in proportion. In the form of the body and eyes, the species are like the *Ædipi*, and quite unlike the small-eyed *Pontoniæ*. The tarsi are those of *Pontonia*. The mandible has the lateral process low bidentate at apex, as in *Ædipus*. The beak is usually more or less ensiform, though sometimes rather broad at base, as in some *Ædipi*. The branchiæ are five in number on either side, and the leaflets are rather short.

The name of the genus is from ἀρπη, *pruning hook*, and alludes to the hooked form of the tarsus. The species have a thin shell, and like the *Ædipi* swim free.

#### HARPILIUS LUTESCENS.

*Corpus paulo depressum. Rostrum angustum, parce recurvatum, squamâ antennali paulo brevius, basi internarum multo longius, supra 7-8-dentatum, infra prope medium 1-dentatum. Pedes antici quoad manus sparsim pubescentes; 2di angusti, manu gracili, fere lineari, digitis linearibus, vix dimidii manus longitudine.*

Body somewhat depressed. Rostrum narrow, sparingly recurved, a little shorter than scale of outer antennæ, and much longer than base of inner, above having seven or eight serratures, and one near middle below. Two anterior feet with the hand sparsely short pubescent. Second feet narrow; hand slender, nearly linear, fingers linear, nearly half as long as hand.

Plate 37, fig. 4 *a*, animal, enlarged four diameters (caudal segment mutilated); *b*, profile of beak; *c*, upper view of head and antennæ, more enlarged; *d*, *d'*, different views of mandible; *e*, maxilliped of first pair; *f*, *ibid.* of second pair; *g*, *ibid.* of outer pair; *h*, extremity of one of eight posterior pairs.

Pacific, reef of Tongatabu.

Length, seven lines. Colour, yellowish, with three brown longitudinal bands in the abdomen, and two in thorax, the latter concave towards one another. [Colours probably not constant for the species.] The beak is curved slightly upward, and like the preceding is acute at apex, both in a vertical and profile view. The larger part of the first joint of the inner antennæ is covered by the eyes. The eyes do not project laterally beyond the carapax. The anterior angles of the carapax are acute. The tooth at outer apex of second antennæ projects much beyond the terminal margin of the scale. The hand of the second pair of legs is scarcely broader than the carpus, a slight pubescence towards extremities of finger and thumb. The carpus is full one-third as long as the hand. Six posterior legs hairy towards apex.

GENUS ANCHISTIA (*Dana*).

Pontoniæ Palæmonique *affinis*. *Corpus vix depressum. Rostrum tenue, sæpius laminatum, elongatum. Oculi mediocres. Maxillipedes externi omnino tenues. Antennæ internæ duobus flagellis instructæ, uno parce bifido. Mandibulæ non palpigeræ. Manus secundæ (in speciebus scrutatis) sat graciles, elongatæ et æquales. Tarsi rectiusculi tenues.*

Related both to *Pontonia* and *Palæmon*. Beak long, slender, usually laminate. Eyes moderately large. Outer maxillipeds throughout slender. Inner antennæ furnished with two flagella, one sparingly bifid. Mandible not palpigerous. Hands of second pair (in species examined) rather slender, long, equal. Tarsi very slender and nearly straight.

The *Anchistiæ* form a link of relationship between *Palæmon* and *Ædipus*. Some of the species are precisely like *Palæmon* in form and habit; yet the inner antennæ have properly but two flagella, one of these two being bifid only for a very short distance at tip. Moreover, the mandibles are without palpi. Unlike *Harpilius* and *Ædipus*, the outer maxillipeds are slender throughout, and the tarsi are nearly straight and slender, as in *Palæmon*. The absence of a palpus from the mandibles, is the surest characteristic for distinguish-



ing the species from those of Palæmon, although they may generally be distinguished by their more salient eyes, hardly compressed and rather longer body, and the inner antennæ with two flagella. The slender, nearly straight tarsi separate them from Harpilius or Œdipus. The lateral process of the mandibles has a broad summit, molar-like, usually, as in Palæmon, and not bidentate as in Harpilius and Œdipus.

The name of the genus alludes to its being in close relationship to genera on either side, from *αγχιστεια*, *relationship*.

#### ANCHISTIA GRACILIS.

*Rostrum tenue, rectum, acutum, longum, squamâ antennali fere brevius, basi antennarum internarum longius, supra 6-dentatum, dente postico inter oculos, infra unidentatum. Antennarum internarum articuli 2dus 3tiusque perbreves. Pedes 2di longi, carpo perbrevi, apice acuto, brachio apice externo acuto, manu subcylindricâ, digitis manu fere triplo brevioribus.*

Beak slender, straight, acute, hardly shorter than scale of outer antennæ, much longer than base of inner pair, six-toothed above, posterior tooth situated between the eyes, unidentate below. Second and third joints of inner antennæ very short. Feet of second pair long, carpus very short, acute at apex, arm acute at outer apex, hand subcylindrical, fingers nearly one-third as long as hand.

Plate 37, fig. 5 *a*, animal, much enlarged; *b*, outline of beak; *c*, mandible; *d*, extremity of terminal process; *e*, maxilliped of first pair; *f*, maxilliped of second pair; *g*, one of the setæ of same; *h*, outer maxilliped; *i*, last joint of same, more enlarged; *k*, under view of carpus and arm of second pair of feet; *l*, extremity of third pair; *m*, one of the setæ of the basal scale of outer antennæ.

Sooloc Sea.

Length, eight or nine lines. Carpus of second pair of feet not one-fourth as long as hand, and about half as long as arm. Mandibles rather slender, with extremity of terminal process five-toothed, the

three median teeth smaller than the outer, extremity of lateral process minutely setigerous. Some of the setæ of basal scale of outer antennæ in part jointed or annulate.

ANCHISTIA LONGIMANA.

*Rostrum elongatum, acutum, basi angustum, tenue, supra 6-dentatum, dente postico oculis posteriore. Antennæ internæ elongatæ, articulis basalibus 2do 3tioque longissimis, apice 2di extremitatem rostri fere attingente, 3tio dimidii rostri longitudine. Pedes 2di prælongi, æqui, brachio apicem rostri multo superante, carpo elongatè obconico, apice interno spinigero, manu longâ, angustâ, digitis dimidio manus multo brevioribus.*

Beak elongate, acute, narrow at base, slender, above six-dentate, last of the teeth posterior to the line of the eyes. Inner antennæ having the base much elongate, second and third joints long and slender, apex of second joint reaching nearly to extremity of beak, third half as long as beak. Feet of second pair very long, equal, arm extending farther forward than apex of beak, carpus long obconical, inner apex with a spine, hand long and narrow, fingers shorter than half the hand.

Plate 37, fig. 6 *a*, head, with antennæ, much enlarged; *b*, beak in profile.

Loc. — ?

Length, six to eight lines. Form, nearly like that of a *Palæmon*; but eyes more oblong, and inner antennæ with but two flagella, besides being peculiar in its long basal joints, the third reaching nearly its whole length beyond the beak, although half as long as the beak, and the whole base longer than basal scale of outer pair. Arm of second pair of feet reaches nearly as far forward as the base of these antennæ; first pair of feet reach about to apex of carpus of second pair. Fingers of hand of second pair about two-fifths as long as hand, and carpus half as long as hand. Basal scale of outer antennæ rather narrow. Six posterior legs very slender, and last pair, when thrown forward,



reaching beyond apex of arm of second pair, and much beyond apex of beak. Tarsus slender and but little curved.

ANCHISTIA ENSIFRONS.

*Rostrum ensiforme, valde recurvatum, squamâ antennali non longius, apice bifidum, supra 6-7-dentatum, infra paulo dilatatum et 3-dentatum. Carapax super orbitam spinâ armatus, infra orbitam spinis duabus in eâdem lineâ horizontali. Antennæ internæ rostrum parce superantes. Pedes antici graciles, apicem carpi 2di non attingentes; 2di crassiusculi, subcylindrici, per carpum manumque rostrum superantes, carpo longo, apice inermi, obtuso, manu prælongâ, lineari, digitis dimidio manus paulo brevioribus. Pedes 6 sequentes gracillimi, longi, fere nudi.*

Beak ensiform, much reflexed, not longer than basal scale of outer antennæ, bifid at apex, above six or seven-toothed, below somewhat dilated and three-toothed. Carapax above line of orbit bearing a spine, below orbit two spines in nearly same horizontal line. Inner antennæ extending but little beyond apex of beak. Anterior feet slender, not reaching to apex of carpus of second pair. Second pair rather stout, subcylindrical throughout, exceeding the beak by the carpus and hand, carpus long, not armed or acute at apex, hand very long linear, fingers not half as long as hand. Six following pairs very slender, long, nearly naked.

Plate 38, fig. 1 *a*, animal, enlarged five diameters; *b*, inner antennæ and eye, more enlarged; *c*, outer antennæ, *ibid.*; *d*, *d'*, mandible in different positions, *ibid.*; *e*, second pair of maxillipeds, *ibid.*; *f*, outer maxilliped, *ibid.*; *g*, extremity of leg of third or fourth pair.

Straits of Balabac, north of Borneo.

Length, eight to nine lines; a female, with eggs under the abdomen, eight lines. The form of the beak and of the body is wholly that of a Palæmon. Yet the mandible has no palpus, and the inner antennæ have properly but two flagella, one being only slightly bifid at tip.



The mandible has the lateral process a regular molar in form, with several prominences, nearly as in Palæmon. The terminal process is tridentate. Basal scale of the outer antennæ quite narrow. Eye rather short, as in Palæmon. Palpus of outer maxillipeds reaches not quite to middle of penult joint. Two very long spines to extremity of caudal segment. Carpus of leg of second pair half as long as hand.

## ANCHISTIA AURANTIACA.

*Corpus vix depressum. Rostrum angustum, integrum, basis antennarum internarum longitudine, squamâ externarum paulo brevius. Pedes antici superficie manus internâ prope basin densè laxèque pubescentes. Pedes 2di graciles, manu parce crassiore quam carpus, fere lineari, digitis dimidio manus multo brevioribus, parce pubescentibus, angustis.*

Body hardly at all depressed. Beak narrow, entire, as long as base of inner antennæ, a little shorter than basal scale of outer pair. Anterior feet with dense short pubescence on inner side of hand near base. Second feet narrow, hand hardly broader than carpus, almost linear, fingers rather more than one-third the length of hand, sparingly pubescent, narrow.

Plate 38, fig. 2 *a*, animal, enlarged six diameters; *b*, first abdominal appendage; *c*, second ditto; *d*, part of caudal segment.

Pacific, among corals of Viti Lebu, Feejees.

Length, half an inch. Colour, light vermilion spotted with yellow. Carapax and body elongate, hardly depressed. Anterior angles scarcely prominent. Last segment of abdomen slightly shorter than caudal lamellæ, a little hairy at tip, with two short spines. Hands of first pair of legs with a little pubescence at tips. Carpus without spines or teeth. Last six legs of thorax rather longer, claw nearly straight and slender; second pair of abdominal legs, with a narrow accessory branch, in addition to the usual pair; third, fourth, and fifth pairs similar, except that the accessory branch becomes smaller, and the whole organ is shorter.



GENUS PALÆMONELLA (*Dana*).

*Palæmoni affinis, rostro tenui, laminato, elongato, pedibus 4 anticis chelatis, 2dis majoribus, antennis internis cum tribus flagellis instructis, mandibulo palpigero. Palpus mandibularis perbrevis, 2-articulatus. Flagella duo antennarum internarum fere ad apices in uno conjuncta.*

Related to *Palæmon*, the beak being long, thin and slender, the four anterior feet chelate, and second pair the larger, the inner antennæ with three flagella, mandibles palpigerous. Palpus of mandibles very short, two-jointed. Two of the flagella of the inner antennæ united nearly to their tips.

In both of the species of the genus here described, the carapax has two spines below the eye in nearly the same horizontal line. The outer maxillipeds are slender, as in *Palæmon*. The anterior legs are very slender; the second pair moderately stout, with the hand nearly cylindrical, and hardly stouter than preceding part of the leg.

## PALÆMONELLA TENUIPES.

*Rostrum rectum, non reflexum, squamâ antennali non longius, supra 6-7-dentatum, dentibus inter se fere æquè remotis, infra 2-dentatum et non dilatatum, apice acutum. Pedes 2di valde elongati, apice brachii apicem rostri vix superante et infra supraque acuto, carpo dimidii manus longitudine, apice spinâ armato, digitis dimidio manus brevioribus. Pedes 6 postici gracillimi fere nudi.*

Beak straight, not reflexed, not longer than basal scale of outer antennæ, above six or seven-toothed, teeth nearly equally spaced; below not dilated, two-toothed, acute at apex. Second pair of feet very long, apex of arm reaching to apex of beak, and acute above and below, carpus half as long as hand, having a spine at apex, fingers not as long as half the hand. Six posterior feet very slender, naked or nearly so.

Plate 38, fig. 3 *a*, part of animal, enlarged; *b*, mandible, more enlarged; *b'*, terminal process of mandible and palpus, still more enlarged; *c*, second pair of maxillipeds; *d*, outer maxilliped.

Sooloo Sea.

Length of body, eight lines. Beak very narrow (vertically), and equally so throughout. Base of inner antennæ but little shorter than beak, and the whole antennæ twice as long as beak. Fingers of hand of second pair in contact. Mandible with terminal process tridentate; palpus very short; lateral process molar-like, nearly as in Palæmon. Outer maxillipeds equally slender throughout; palpus considerably longer than second joint.

#### PALÆMONELLA ORIENTALIS.

*Rostrum rectum, non recurvatum, squamâ antennali non longius, apice acutum, supra 6-dentatum, dentibus inter se fere æque distantibus, infra 1-dentatum. Pedes 2di crassiusculi, subcylindrici, apice brachii apicem rostri non attingente et non acuto, carpo brevior quam dimidium manus, apice non acuto, digitis dimidio manus brevioribus. Pedes 6 postici fere nudi, graciles.*

Beak straight, not reflexed, not longer than scale of outer antennæ, acute at apex, above six-toothed, teeth nearly equidistant, below one-toothed. Feet of second pair rather stout, subcylindrical, apex of arm not reaching to apex of beak and not acute, carpus shorter than half the hand, and apex not acute, fingers shorter than half the hand. Six posterior feet naked or nearly so, slender.

Plate 38, fig. 4 *a*, part of a female, enlarged; *b*, mandible, more enlarged; *c*, maxilliped of second pair; *d*, outer maxilliped.

Sooloo Sea.

Length of body of a female carrying eggs, eight lines. Beak rather wider than in the *tenuipes*, but not narrower towards base than in outer half. Leg of first pair reaches about to apex of carpus of second



pair. Six posterior legs twice stouter than in the *tenuipes*. Mandible with terminal process tridentate, lateral process somewhat molar-like, with three or more prominences. Palpus of outer maxillipeds considerably longer than second joint of these organs.

GENUS PALÆMON (*Fabricius*).

1. *Carapax margine antico infra oculum spinis duabus armatus.*

PALÆMON AFFINIS, *Edwards*.

Plate 38, fig. 5 *a*, animal, natural size; *b*, outline of beak and cephalothorax; *c*, view of base of inner antennæ; *d*, mandible; *e*, inner maxillæ; *f*, second maxilliped; *g*, outer maxilliped.

New Zealand.

Beak a little longer than scale of outer antennæ, seven-toothed above and four-toothed below, a little recurved, bifid at apex, second of the teeth below (counting from apex) directly beneath the first of those above, and last of those above near middle of back of cephalothorax. Hands all very slender; first pair not half length of carpus; second pair considerably longer than carpus, fingers much less than half the length of the hand, a little short hairy within. Following legs very slender, unarmed and naked, except a few hairs at tips of joints, and for a short distance at lower apex of penult joint two flagella, inner antennæ united to eighth or ninth joint, tooth of first basal joint extends very nearly to apex of second basal joint. Outer maxilliped short, about reaching to apex of base of outer antennæ. Extremity of abdomen very narrow, having three minute spinules, and between them, two longish setæ. Length, two inches. Nearly pellucid, with some bright green lines of extreme delicacy along the cephalothorax and abdomen; four posterior legs with two red spots, one at either extremity of the femur; second pair, with three red spots, one in the hand at the base of the fingers.

Although very near the *P. squilla*, the coalesced flagella of the inner antennæ are united to a longer distance from the base of these organs;

the palpus of the outer maxillipeds is considerably shorter than the second joint.

PALÆMON DEBILIS.

*Rostrum prælongum, gracile, paulo recurvatum, squamâ antennali multo longius, apice bifidum, dimidio apicali supra integro, basali 4-6-dentato, margine inferiore 6-9-dentato. Antennarum internarum flagella duo longè conjuncta. Pedes nudi, inermes; 1mi 2dique inter se subæquales, parvuli, gracillimi, manu dimidio carpi paulo longiore, non incrassatâ. Flagellum minus antennarum internarum perbreve.*—Var.  $\alpha$ , *Rostrum supra 4-dentatum, infra 6-dentatum; var.  $\beta$ , attenuatus, Rostrum longissimum, supra 6-dentatum et infra 9-dentatum.*

Beak very long and slender, a little reflexed, much longer than basal scale of outer antennæ, bifid at apex, apical half above entire, basal half with four to six teeth, inferior margin with six to nine teeth. Two flagella of inner antennæ united for a considerable distance. Feet all naked and unarmed; first and second pairs subequal, quite small and slender, hand longer than half the carpus, not incrassate. The smaller flagellum of inner antennæ very short.

Plate 38, fig. 6, cephalothorax, enlarged two diameters.

Sandwich Islands.

Length, 1-1½ inches. Beak in the common variety one-fourth to one-half longer than antennary scale; first spine or tooth of upper margin (counting from extremity), is nearly over the fifth of the lower margin. The posterior tooth of beak is situated but little back of line of eyes, and the next one is just anterior to this line. Hands nearly naked; fingers of second pair a little shorter than half the hand.

Var. *attenuatus* (fig. 7, Plate 38, enlarged two diameters).—A specimen from Hilo, Hawaii, has the hands equal, and feet naked and slender, as in the preceding; but the beak is much longer, being two-thirds longer than the antennary scale, and there are six teeth to basal half of upper margin, and nine teeth below. The specimen is a female. It is, probably, a variety of the *debilis*.



## PALEMÓN EXILIMANUS.

*Rostrum lanceolatum, apice brevi deflexum, supra paulo arcuatum et 6-dentatum, infra 3-serratum, squamam antennalem non superans. Flagella duo antennarum internarum parce conjuncta. Pedes antici gracillimi, manu plus duplo brevior quam carpus; 2di non crassiores, nudi, manu duplo longiore, carpo dimidio longiore quam manus, digitis dimidio manus paulo brevioribus. Pedes duo postici tenuissimi, prorsum porrecti apicem rostri superantes.*

Beak lanceolate, somewhat arcuate above and six-dentate, at tips for a short distance deflexed, below three-dentate, not longer than basal scale of outer antennæ. Two flagella of inner antennæ united for a very short distance. Anterior feet very slender, hand not half as long as carpus; second pair not stouter, naked, hand twice as long, carpus once and a half the length of the hand, fingers hardly half as long as the hand. Posterior feet very slender, when thrown forward, extending beyond the beak.

Plate 38, fig. 8, cephalothorax, enlarged two diameters.

Feejee Islands, Pacific Ocean.

Length, one and a half inches. Teeth of upper margin of beak nearly equidistant along the margin; beak a little shorter than antennary scale. Hand of first pair of feet laxly pubescent about the fingers, as stout as hand of second pair though half shorter, and neither stouter than the carpus. Outer maxillipeds of moderate length, reaching somewhat beyond the base of the outer antennæ.

PALEMÓN SQUILLA, *Fabr.*

Plate 38, fig. 9, cephalothorax, enlarged two diameters.

Madeira.

This species is closely related to the *P. squilla*, if not identical with

it. In our single specimen, the first or outer tooth of the lower margin of the beak is directly beneath the first of the upper margin. The hand of the second pair is full three times as long as that of the first pair. Length of body, one and one-fourth inches.

PALÆMON CONCINNUS.

*Rostrum gracillimum, squamâ antennali vix longius, basi antennarum internarum multo longius, ensiforme, fere rectum, apice bifidum vel trifidum dorsoque non altius, infra remotè minutèque 5-dentatum, supra 5-6-dentatum, dente 1mo vel externo a extremitate rostri remoto, penultimo inter oculos. Maxillipedes externi apicem basis antennarum externarum paulo superantes, hirsuti. Pedes 1mi apicem squamæ antennalis fere attingentes. Pedes duo postici prælongi, tenuissimi, articulo 4to apicem maxillipedis externi fere attingente.*

Beak very slender, hardly longer than basal scale of outer antennæ, much longer than base of inner antennæ, ensiform, nearly straight, its apex bifid or trifid, and not raised above line of back, remotely and minutely five-toothed below, 5-6-toothed above, the first tooth remote from extremity, and the penultimate situated between the eyes. Outer maxillipeds reaching a little beyond apex of base of outer antennæ, hirsute. First pair of feet extending forward nearly to apex of antennary scale. Posterior feet very long, and slender, apex of fourth joint reaching nearly to apex of outer maxillipeds.

Plate 38, fig. 10 *a*, cephalothorax, enlarged two diameters; *b*, beak, enlarged, from a larger specimen.

Feejee Islands.

Length, one and one-fourth to one and three-fourths inches. Form slender, the sides of cephalothorax closely approximating along the venter. The fourth of the teeth on lower margin of the beak situated nearly below the second of those on the margin, or below a point between the first and second. Hand of anterior pairs with the fingers half the length of the hand.



PALEMÓN NATATOR, *Edwards.*

Plate 38, fig. 11, mandible, enlarged.

Gulf-weed, Atlantic Ocean. September, 1838.

Beak lanceolate, both margins arcuate; teeth of upper margin of beak ten to twelve in number. Below there are four teeth, but they are often nearly or wholly concealed by the hairs of this margin, so as to be detected with some difficulty. The body is nearly pellucid along the medial line, and is brownish red or yellow either side, giving the animal a peculiar appearance in the water. Length, three-fourths of an inch. Maxillipeds lax hirsute. The two flagella of inner antennæ united only for a very short distance.

EDWARDS, Crust., ii. 393; GOODSIR, Ann. Mag. Nat. Hist. 1845, xv. 74.

*Leander erraticus*, DESMAREST, Ann. Entomol. Soc. de France, 1849, p. 87; and GUERIN'S Mag. de Zool.

2. *Carapax margine antico infra oculum spinâ unâ armatus, et pone hanc alterâ minore.*

PALEMÓN GRANDIMANUS (*Randall*).

Plate 38, fig. 12 *a*, cephalothorax, natural size; *b*, smaller hand of second pair, natural size.

Sandwich Islands.

Rostrum lance-shaped, not reflexed or scarcely so, as long as scale of antennæ, teeth above running regularly to apex, fourteen or fifteen in number, below four. Flagellum of outer antennæ pubescent (pubescence seen only when in a liquid). Outer maxillipeds short, reaching but little beyond apex of base of outer antennæ. Anterior legs very slender, not half as long as next pair; second pair large, very unequal, the longer very long, with the hand very stout, and two-thirds as long as the body, nearly three times as long as carpus, scabrous,

partly pubescent, fingers slender, half as long as hand, not meeting along their inner margins when closed, acutely dentate, of which one tooth is stouter than the others, the left or right may either of them be the larger hand; smaller hand having the fingers somewhat gaping, long, densely hirsute within. Following legs very slender, unarmed, a few thin hairs, which are rather short but most numerous on the fifth joint.

Length, two and a half to three inches; length of larger hand, one and three-fourths inches.

In a younger specimen, about two inches long, the fingers of the smaller hand (the right) are nearly in contact, though very hairy within, the beak is very slightly reflexed and there are fourteen teeth to upper margin of beak and four below.

Flagella of inner antennæ all slender and disunited nearly to base.

*P. grandimanus*, RANDALL, Jour. Acad. Nat. Sci. Philad., viii. 142.

#### PALÆMON LANCEIFRONS.

*Rostrum lanceolatum, supra multum arcuatum et 12-dentatum, apice vix recurvatum, infra 3-dentatum, squamam antennalem longitudine non superans. Pedes antici gracillimi, carpo plus duplo longiore quam manus. Pedes 2di longissimi (corpore longiores), fere cylindrici, manu graciliore et non breviora quam carpus, scabriculâ, digitis brevibus, superiore hirsuto. Pedes postici si prorsum porrecti apicem rostri superantes.*

Beak lanceolate, much arcuate above, and twelve-dentate, with the tips only slightly reflexed, three-dentate below, not longer than the basal scale of outer antennæ. Anterior feet very slender, carpus more than twice as long as hand. Second pair very long (longer than body) nearly cylindrical, hand more slender and not shorter than carpus, somewhat scabrous, fingers short, the superior hirsute. Posterior feet, when thrown forward, reaching beyond apex of beak.

Plate 38, fig. 13 *a*, cephalothorax, natural size; *b*, beak, enlarged.

Manilla, Island of Luzon, one of the Philippine Islands.



Length of body, two inches. The teeth of beak range along its whole upper margin, and are nearly equidistant throughout; those below are very short. The fingers of the hands of second pair are about two-fifths whole length of hand; the carpus is nearly twice as long as the arm.

PALÆMON ACUTIROSTRIS.

*Rostrum lanceolatum, apice non recurvatum, squamâ antennali non longius, supra 14-16-dentatum, dentibus confertis, usque ad apicem continuatis, infra 4-5-dentatum. Maxillipedes externi mediocres. Pedes antici gracillimi, manu dimidii carpi longitudine. Pedes 2di longi, tenues, omnino bene scabri, manu parce crassiore et duplo longiore quam carpus, digitis dimidio manus brevioribus, apice carpi rostrum paulo superante. Pedes sequentes inermes.*

Beak lanceolate, not reflexed at apex, not longer than basal scale of outer antennæ, fourteen to sixteen teeth above, teeth crowded and continued quite to extremity, four to five teeth below. Outer maxillipeds of moderate length. Anterior feet very slender, hand half as long as carpus. Second pair long, slender, strongly scabrous throughout, hand but little stouter and twice longer than carpus, fingers not half as long as hand, apex of carpus reaching a little beyond extremity of beak. Following legs unarmed.

Plate 39, fig. 1 *a, a'*, cephalothorax of different specimens, natural size; *b*, eye, base of inner antennæ, and part of anterior margin of carapax, and lower margin of beak.

Sandwich Islands.

Length of body, two and a half to three inches. Teeth of beak covering whole upper margin, and second upper tooth (counting from extremity) situated over first lower; the last upper tooth one-third the length of the cephalothorax, back of the line of the eyes. Flagellum of outer antennæ naked and not pubescent as in the *P. grandimanus*. The hands of the second pair of legs are very closely scabrous even to the tips of the fingers, and have but few hairs in any

part; the fingers are parallel and nearly in contact when closed; in both hands they are alike scabrous, and nearly naked. The basal scale of the outer antennæ is very slightly longer than the beak. The beak in the larger specimens is somewhat arcuate above, but in younger it is nearly straight, and with only four teeth below.

## PALÆMON EQUIDENS.

*Rostrum rectè ensiforme, verticaliter sat latum, apice parce reflexum, squamâ antennali non brevius, supra rectiusculum et 10-11-dentatum, dentibus inter se fere æque remotis, et supra tertiam partem dorsi carapacis continuatis, duobus terminalibus minoribus et fere apicalibus; infra arcuatum et 6-dentatum. Pedes 1mi rostrum multo superantes. Pedes 2di longi, subcylindrici, subtilissimè spinulosi, brachii apice apicem rostri attingente.*

Beak straight ensiform, and vertically rather broad, very slightly reflexed at apex, not shorter than basal scale of outer antennæ, above nearly straight and ten or eleven-toothed, teeth about equally spaced, and continued over one-third of the back of the carapax; last two teeth smaller and nearly apical, below six-toothed. Anterior feet extending much beyond the beak; second pair long, subcylindrical, very minutely spinulous, extremity of arm just reaching to apex of beak.

Plate 39, fig. 2 *a*, outline of beak, natural size; *b*, arm.

Singapore.

Length of body to extremity of beak, four and two-thirds inches. The specimen is mutilated in its second pair of feet, and we cannot give the characters of the hands. The species belongs to the division of the genus in which the carapax has but one spine on the anterior margin either side below the eye, with a second more posterior, and is near the *P. forceps*.



PALÆMON CARCINUS (*Fabr.*)

Singapore, East Indies.

Smaller specimen, six inches long, including beak. Colour, grayish and greenish brown, or blue; long arms, dark olive; carpus, blue; eye, black. Larger specimen, nine inches long. Colour, mostly olive-green; extremity of abdomen, dark blue; long arms, blue-black, with some parts near the joints and along outer side smalt-blue.

3. *Carapax margine antico infra oculum spinâ unâ armatus, pone hanc non alterâ.*

PALÆMON GAUDICHAUDII (*Edwards*).

Valparaiso, Chili.

EDWARDS, Crustacés, ii. 400; D'Orbigny's S. A. Crustacea, pl. 17, f. 2.

GENUS HYMENOCERA, *Latreille*.

*Rostrum mediocre. Oculi oblongi. Antennæ internæ bifidæ, ramis brevibus, uno foliaceo. Pedes antici tenues, manu elongato-subulatâ, digitis minutis. Pedes secundi lati, manu latissimè foliaceâ. Maxillipedes foliacei.*

Rostrum of moderate length. Eyes oblong. Inner antennæ bifid, branches short, one foliaceous. Feet of anterior pair slender, having a slender subulate hand, fingers minute at apex. Second feet with a very broad foliaceous hand. Six remaining feet vergiform, unguiculate. Maxillipeds foliaceous.

This genus was established by Latreille, but has been but imperfectly described, as the specimen is not to be found in the collections at Paris. The description of the Paumotu species and the figure were made from the living animal, and supply some additional infor-

mation respecting this peculiar genus; but we have to regret the loss of the specimen by the disastrous wreck of the Peacock, in consequence of which we are prevented from giving minuter details.

The slender anterior pair of feet and stout second pair, with broad, equal hands, show a close relation to *Pontonia*; and this relation is farther seen in the foliaceous form of the outer maxillipeds, a characteristic observed to some extent in *Pontonia*, and more complete in *Gnathophyllum*. The abdomen is flexed after the third segment nearly as in *Hippolyte*, and is somewhat abruptly narrower posterior to this segment.

#### HYMENOCERA PICTA.

*Rostrum longiusculum, in carapacem posticè productum, serratum. Segmentum abdominis tertium posticè obtuso-triangulatum. Antennæ anticæ breves, basi parce longiore quam rostrum, flagellis dimidio basis brevioribus, flagello foliaceo breviter spatulato, altero tenuissimo, brevior. Antennæ externæ corpore longiores, laminâ basali rostro longiore. Manus pedis secundi trapezoidalis, lata, oblonga, apice latior et truncata, dorso recta, angulis rotundata, digito brevi, extus serrulato. Maxillipedes externi oblongi, articulo secundo oblongo, tertio lato, trapezoidali, vix oblongo.*

Beak rather long, continued in a crest on carapax. Third abdominal segment obtuso-angular behind. Inner antennæ short, base slightly longer than beak, branches not half as long as base, the foliaceous one short spatulate, the other shorter and very slender; second pair longer than body, basal scale longer than beak. Hand of second feet broad, oblong trapezoidal, broadest at apex and truncate, dorsal margin straight, angles rounded, finger short, serrulate without. Exterior maxillipeds oblong, second joint oblong, third broad trapezoidal, hardly oblong.

Plate 39, fig. 3 *a*, animal, natural size, *b*, main branch of exterior maxillipeds, enlarged; *c*, extremity of first legs, magnified four diameters.

Coral reefs of Raraka, one of the Paumotu Islands.



Length, about two inches. Colour, a light pink, with large purple spots generally bordered by yellow; several of these spots on the foliaceous hand. The carapax curves inward below, so as to cover the space quite to the exterior maxillipeds; there is a spine on the carapax just below the eye. Caudal segment oblong tapering; a few short hairs at apex and two spines either side. Caudal lamellæ rounded at apex and furnished with short hairs; the outer two-jointed. Eyes on oblong cylindrical pedicels. Outer maxillipeds cover closely the mouth, the first three joints of the two lying in contact; the following portion, which is foliaceous, is bent downward. The second joint is subcylindrical; the third is widened outwardly into a broad trapezoidal joint, broadest below, which in under view conceals from sight the base of the outer antennæ. The foliaceous portion has a small lamellar joint at apex. Legs all naked. The hand of the first pair is slender subulate, and the finger is not more than one-eighth of the hand in length. Foliaceous hand of second pair membranous, excepting outer margin. Finger about one-third the length of the hand. The carpus is much shorter than the finger, and has two acute teeth at apex; the arm is two-thirds as long as the hand, and has two teeth at apex. The following feet are slender and similar, the third pair is the shortest, the fifth the longest. The claw is very short and minute.

GENUS CRYPHIOPS, *Dana*.

*Oculi sub carapace profundè celati. Rostrum et carapax uti in Pontoniâ. Antennæ internæ flagellis tribus confectæ. Mandibulæ palpo 3-articulato instructæ. Maxillipedes externi subtenuis, longitudine mediocres.*

Eyes concealed deeply under the carapax. Beak and carapax as in *Pontoniâ*. Inner antennæ with three flagella. Mandibles having a three-jointed palpus. Outer maxillipeds rather slender, of medium length.

This genus is the only one, hitherto discovered among the Palæmoninæ, in which the eyes are concealed under the carapax. They are much more deeply covered than in *Alpheus*, and the carapax has no swelling above, and no translucency; so that the animal can only

see out between the carapax and the bases of the antennæ, a very narrow space, that may be opened a little by the depression of the antennæ. The body is somewhat depressed, as in *Pontonia* and *Ædipus*, and the beak is rather short, and in form is oblong-triangular, with a keel above, which is dentate. The outer antennæ are situated mostly below the inner. The scale is large, and one-third or more of its length is beneath the carapax. The terminal process of the mandible has three strong triangular teeth, and the palpus is rather long and slender, with the joints subequal. The outer maxillipeds are narrow, with the penult joint a little more than half the preceding in length, and hardly one-half longer than the last joint. The abdomen is rather broad, and terminates in a narrow segment, the sides of which (in our dried specimen) are curved downwards, so as to make nearly a cylinder. The abdominal appendages have an oblong base, which is calcareous externally like the carapax. The legs are nearly as in other *Palæmoninæ*. The first pair is slender and about as long as the second; the second is rather stout, with an oblong hand; the fingers are similarly acuminate, but still are spoon-excavate as seen under a magnifier.

The name of the genus alludes to the concealed eyes, and is from *κεκρυμμενος*, *concealed*, and *ὄψις*, *eye* or *sight*.

The only species seen was found in fresh-water streams.

#### CRYPHIOPS SPINULOSO-MANUS.

*Rostrum triangulatum, squamâ antennali brevius, basin antennarum internarum superans, supra æque 7-dentatum, infra prope apicem unidentatum. Pedes 2di 1mos vix superantes, minute spinulosi, manu plus duplo longiore quam carpus, digitis dimidio manus longioribus, apice minutè cochleari-excavatis. Pedes antici nudiusculi, manu infra hirsutâ. Pedes 6 postici quoque nudiusculi, articulo 5to infra parce armato, tarsis unguiculatis.*

Beak triangular, shorter than antennary scale, extending beyond base of inner antennæ, above regularly seven-toothed, below a single tooth near tip. Feet of second pair hardly reaching beyond the first, minutely spinulous, hand more than twice as long as carpus, fingers longer than half the hand, minute spoon-excavate at tip.



Anterior feet nearly naked, hand hirsute below. Six posterior pairs nearly naked, penult joint somewhat armed below, tarsi unguiculate.

Plate 39, fig. 4 *a*, animal (female), natural size, with antennæ in part mutilated, and part of the carapax removed, so as to show the eye and base of inner antennæ; *b*, under view, showing mandibles in natural position and base of outer antennæ, magnified two and a half diameters; *c*, second pair of maxillipeds, enlarged five diameters (palpus, *p*, and branchiæ, *b*, mutilated); *d*, outer or third pair, *ibid.*; *e*, base of first pair of legs; *f*, extremity of moveable finger of second pair of legs; *g*, part of third flagellum of inner antennæ, enlarged; *h*, profile of beak, natural size.

Fresh-water streams, Chili, fifty to one hundred miles from the sea.

Length of body, three and three-fourths inches. Colour, olive-green. Carapax smooth and naked; a spine on front margin, half way between beak and outer angle. Fingers of hand of second pair subcylindrical. Hand of first pair nearly half shorter than carpus. Penult abdominal segment half longer than the preceding, and below triangulate and acute behind at middle, the extremity of the triangle being prolonged into a slender and hardly acute spine. Abdominal appendages calcareous, outer lobe of base nearly rounded or subacute, and minute hirsute at margin, outer scale with the transverse suture triangulate, and having a small D-shape areolet in the bottom of the triangle, which the suture includes.

#### SUBFAMILY OPLOPHORINÆ.

The species of this family observed by us constitute the new genus *Regulus*, and are brilliantly phosphorescent. They have the second pair of feet stoutly chelate, as in *Palæmon*, also a serrated beak; and the mandibles bipartite above and palpigerous. They, therefore, appeared to be of that family. But, as in *Oplophorus*, the basal scale of the outer antennæ is long and narrows to a sharp point, a character not found among other *Macroura*, and the outer margin of this scale is dentate or spini-dentate; moreover, a segment of the abdomen is

produced backward into a long spine on the dorsum, a peculiarity which suggested the name *Oplophorus*, given by Edwards. *Regulus* differs from *Oplophorus* in having no palpi to the legs, and also, in having no chelæ to the anterior feet.

The species are nearly transparent, and live in the open ocean.

GENUS *REGULUS*, Dana.

*Corpus vix compressum. Rostrum elongatum, dentatum. Segmentum abdominis 3tium dorso postice instar spinæ productum. Squama antennarum acuminata, extus pauci-dentata. Pedes non palpigeri; antici graciles, parvi, articulo ultimo styliformi; 2di crasse chelati; 3tii 4ti 5tique longi, graciles. Antennæ internæ flagellis duobus connectæ.*

Body hardly compressed. Beak elongate, dentate. Third segment of abdomen produced behind on the back into a spine. Basal scale of outer antennæ few-toothed on outer margin. Feet without palpi; first pair small and slender, last joint styliform; second pair stout chelate; third, fourth, and fifth pairs long and slender.

The animal in swimming shows only its three posterior pairs of legs (as in fig. 5, pl. 39), the anterior being thrown forward directly under the body. The beak is broad as it approaches its base, and forms an arched cavity over the eyes. The abdominal segments are more or less pointed at the lateral margin, and also ciliate. The two processes of the mandible are quite narrow; the palpus is three-jointed and rather long, the joints nearly equal. The second pair of maxillipeds has the terminal segment at the lower extremity of the preceding. The outer pair is slender and long (exceeding the first pair of feet in length); the third joint is not half as long as the following, and this, the last, is subterete and acuminate; the palpus is a little longer than the second joint. The hands in both species have the fingers short and gaping. The fifth pair of legs is shorter than either of the two preceding.

Both species also have a supra-orbital tooth, which is situated at the termination of the lateral margin of the beak.



## REGULUS LUCIDUS.

*Rostrum prælongum, recurvatum, acuminatum, versus basin horizontaliter sensim latius deinde lateribus subparallelum, supra 8-9-dentatum, infra 3-dentatum. Squama antennalis perangusta, rostro paulo brevior, dentibus tribus externis parvulis. Pedes 2di crassi, manu oblongâ, digitis dimidio manus brevioribus, parce hiantibus. Pedes 6 postici sparsim laxèque pubescentes.*

Beak very long, recurved, long acuminate, gradually broader towards base, then having the sides nearly parallel over the eyes, above eight or nine-toothed, below three-toothed. Antennary scale very narrow, a little shorter than beak, the three teeth of outer margin very small. Feet of second pair stout, hand oblong, fingers not half as long as hand, sparingly gaping. Six posterior feet sparsely lax pubescent.

Plate 39, fig. 5 *a*, female, much enlarged; *b*, outline of beak; *c*, *d*, *e*, the outer maxilliped, foot of first pair, and of second pair, severally, in their relative position as regards one another and the beak; *f*, base of inner antennæ; *f'*, part of the slender flagellum near middle; *g*, scale of outer antennæ; *h*, part of flagellum of outer antennæ; *i*, mandible; *k*, first maxilla; *l*, first maxilliped; *m*, second maxilliped; *n*, outer maxilliped; *o*, outline of back of abdomen; *p*, side of one of abdominal segments; *q*, eggs, natural colour.

Off Assumption Island, one of the Ladrões, thirty miles distant; taken December 30, 1841.

Length, nine lines. Colourless, except faint red in parts of abdominal segments, and deep red internally in thorax; beak and extremities of basal scale of outer antennæ, orange. Very brilliantly phosphorescent. Caudal segment slender tapering, with apex narrow and bearing two minute spines, also two pairs of spines on lateral margin. Outer caudal lamella not jointed, the outer margin ciliated, as well as inner extremity, but hairs short; lamellæ a little shorter than caudal segment. Flagellum of outer antennæ longer than body. Flagella

of inner antennæ, each about half as long as other antennæ, the slender branch the longer, the larger rather stout towards base, and furnished on the outer side with a short even row of hairs curved at apex. Eggs, grass-green. Margin of segments of abdomen set with minute spinules.

#### REGULUS CRINITUS.

*Rostrum longiusculum, non recurvatum, supra 9-10-dentatum, infra prope apicem 2-dentatum, versus basin super oculos subito valde latior deinde posterius parce angustans. Squama antennalis rostro non brevior, paulo lata, dentibus tribus externis prominentibus. Pedes 2di crassè chelati, manu oblongâ, digitis brevibus, hiantibus. Pedes 6 postici laxè criniti, articulo 3tio parium 3tii 4tique infra 3-4-serrato.*

Beak moderately long, not recurved, nine to ten-toothed above, below near apex two-toothed, towards base over eyes abruptly much broader, then narrowing a little. Antennary scale much broader than in *R. lucidus*, not shorter than beak, three teeth of outer margin rather prominent. Feet of second pair stout chelate, hand oblong, fingers short, much gaping. Six posterior feet lax crinite; third joint of third and fourth pairs with three or four serratures below.

Plate 39, fig. 6 *a*, animal, enlarged; *b*, upper view of beak; *c*, basal scale of outer antennæ; *d*, extremity of outer maxillipeds, inner view; *e*, row of spines on same; *f*, extremity of first pair of legs; *g*, hand; *h*, extremity of foot of third or fourth pair.

Sooloo Sea.

Length of body, ten lines. The dorsal line of the cephalothorax curves downward at the commencement of the beak, so that the extremity of the beak is at much the lowest level; the teeth of the beak are rather close, the apex of each one reaching usually to base of next. Of the two below, the second is under the first of those above (counting from apex). The fingers of the hand bear short tufts of hairs; the tarsus is armed with a few minute spinules.



## SUBTRIBE IV. PENÆIDEA.

WHILE many acknowledged species of the subtribe Penæidea (or "Tribu des Penéens") have no palpus attached to the legs, there are other species, that have none of the true characteristics of the group, excepting the uncertain one, of having this palpus. De Haan first perceived the true relations of these supposed Penæan genera, and transferred them to the other divisions, where their affinities place them. The several reasons for the limits we have adopted for this group have been mentioned on a preceding page. It marks a degradation in rank among the Macrourea, which degradation is exhibited in two ways. In the *higher* species of the group, the functions of the first and second pairs of legs are divided with the third pair, this last pair being didactyle, like the second, and of much greater size. In the *lower* species, the legs all become slender, and none are stout didactyle; and often the second pair of maxillipeds, or even the first pair, is elongated and pediform, while also the posterior legs become rudimentary, as a result, evidently, of a greater prostration of the forces of life. It is this diffusion of the forces which in the superior Macrourea are subcephalic, along the range of the cephalothorax, that characterizes the species of the Penæus division. Another character distinguishing the Penæoids, and apparently another mark of degradation, is the fact that the third abdominal segment, instead of having the peculiar condition of overlapping laterally the segment either side, for the greater compactness of the whole, is but one of the common series, being laterally overlapped like the following, by the segment preceding it.

The mandible in this group is peculiar in having a simple dentate summit, and generally the organ is placed very obliquely, instead of having the summit at all flexed inward. All the species, as far as examined, have a palpus to the mandible, which is either short and stout, or slender in form.

The Penæidea include three families, distinguished by the character of the legs and the second and third pairs of maxillipeds. They are as follows:—

Fam. I. PENÆIDÆ.—Pedes 6 antichi chelati, 3tiis longiores et plus minusve validiores.

Fam. II. SERGESTIDÆ.—Pedes toti debiles, 2di 3tiique consimiles, sive vergiformes sive obsoletè didactyli. Maxillipedes externi tenues.

Fam. III. EUCOPIDÆ.—Pedes toti debiles, 2di 3tiique non chelati, 1mi et maxillipedisque externi monodactyli et subprehensiles.

In the single species of Eucopidæ examined, the second pair of maxillipeds is subprehensile and similar in its monodactyle character to the third pair. These three pairs of monodactyle feet, anterior to the four posterior thoracic pairs, approximate the species of Eucopidæ to the Squillidea.

The following are the genera of living species in these families :

#### FAM. I. PENÆIDÆ.

- G. 1. SICYONIA, *Edw.*—Pedes 6 antici lineares, 4 postici non annulati. Carapax breviter rostratus, semicalcareus, dorso carinato. Pedes abdominales laminâ unâ instructi. Maxillipedes 2di 3tiique non palpigeri. Antennæ internæ perbreves.
- G. 2. PENÆUS, *Latr.\**—Pedes 6 antici lineares, 4 postici non annulati. Carapax elongato-rostratus, rostro ensiformi. Pedes abdominales laminis duabus instructi. Maxillipedes externi bene palpigeri.
- G. 3. STENOPUS, *Latr.*—Pedes 6 antici lineares, 4 postici longi, annulati. Rostrium longitudine mediocre. Maxillipedes externi brevissimè palpigeri.
- G. 4. SPONGICOLA, *De Haan.†*—Pedes 4 antici filiformes, 2 sequentes unus vel ambo crassissimi; 4 postici non annulati. Carapax bene rostratus, rostro subensiformi. Maxillipedes externi non palpigeri.

#### FAM. II. SERGESTIDÆ.

- G. 1. SERGESTES, *Edw.*—Carapax brevissime rostratus. Pedes thoracis non palpigeri, 2di 3tiique obsoletè didactyli, 5ti parvuli.
- G. 2. ACETES, *Edw.*—Carapax minute rostratus. Pedes thoracis non palpigeri, 2di 3tiique obsoletè didactyli, 5ti obsoleti.
- G. 3. EUPHEMA, *Edw.*—Carapax bene rostratus. Pedes thoracis elongato-palpi-

\* It is doubtful if *Aristeus* of Duvernoy (*Ann. des Sci. Nat.*, xv. 1841, pl. 4) should be separated from *Penæus*, with which it agrees in form, legs, antennæ, &c. The form of the branchiæ is somewhat peculiar, but they are not essentially different in structure from those of the *Penæi*.

† *Faun. Japon. Crust.*, p. 189, tab. 46, f. 9.



geri, 6 antici didactyli, manubus parvulis, 4 postici filiformes, ciliati, non annulati. Branchiæ foliosæ. Abdomen dorso uni-spinosum.—An hujus sedis est?

FAM. III. EUCOPIDÆ.

G. EUCOPIA, *Dana*. — Carapax non rostratus, fronte integro. Pedes thoracici elongato-palpigeri, palpis natatoriis. Maxillipedes 2di 3tii et pedes 1mi monodactyli et subprehensiles.

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SICYONIA CARINATA, *Edwards*.

Plate 40, fig. 1, animal, natural size.

Harbour of Rio Janeiro; common.

Length, three to four inches. Colour, olive-green clouded with white; sides of abdominal segments with elevated parts whitish; outer caudal lamellæ having a large bright smalt-blue spot; thoracic legs, flesh-red; second antennæ, with alternate bands of yellow or flesh-red and dark brown, about ten oblong bands in all. Shell nearly calcareous. Beak very short and reflexed, bifid at tip, and having two teeth a short distance from the apex; also, on carina, two teeth near middle of back, and one on posterior third. Thoracic legs quite slender.

EDWARDS, *Ann. des Sci. Nat.*, xix. 344, pl. 9, f. 44; *Crust.*, ii. 410.

PENÆUS CARINATUS.

*P. setifero affinis. Rostrum squamâ antennali parce longius, paulo sinuosum, extremitate styliforme, parce recurvatum, apice vix altius quam dorsum, supra 7-8-dentatum, infra 3-dentatum. Flagella antennarum internarum articulis duobus precedentibus non longiora. Pedes 5ti 4tis non graciliores.*

Near *P. setiferus*. Beak slightly longer than the basal scale of outer antennæ, somewhat sinuous, styliform at extremity, apex hardly

above level of back, above seven or eight-toothed, below three-toothed. Flagella of inner antennæ not longer than two preceding joints. Posterior thoracic legs not notably more slender than those of preceding pair.

Plate 40, fig. 2, outline of carapax, natural size.

Singapore.

Length to extremity of beak, seven inches; of abdomen alone, four and a half inches. This species has the long eyes, carinate back of carapax, and most other characters of the *setiferus*, a West India species. It differs, in having three teeth on the under side of the beak, instead of two.

#### PENÆUS AVIROSTRIS.

*Rostrum rectum, extremitate anguste styliforme et non dentatum, non recurvatum, basi supra prominenter dilatatum et 6-dentatum, infra rectissimum, integrum, squamam antennalem longitudine non superans. Carapax dorso postico non carinatus nec sulcatus. Flagella antennarum internarum articulis duobus precedentibus non longiora. Oculi breves. Pedes 5ti 4tis multo graciliores.*

Beak straight, extremity narrow styliform and toothless, not recurved, at base on upper side prominently dilated and six-toothed, below quite straight and entire, whole length not exceeding that of basal scale of outer antenna. Carapax in posterior part not carinate nor sulcate. Flagella of inner antennæ not longer than two preceding joints. Eyes short. Two posterior feet much more slender than those of the preceding pair.

Plate 40, fig. 3, outline of carapax, with leg of third pair, natural size.

Singapore.

Length of body, five inches. The beak is without teeth on either



margin in its outer half, and in this part is very straight and subulate, and on a level with the back of the carapax; three of the teeth above are posterior to the base of the eyes. The spine below the eyes, and that on the lateral surface, a little distance back, are very small. The last abdominal segment is acute, without lateral spinules.

PENÆUS VELUTINUS.

*Carapax abdomenque omnino breviter velutini. Rostrum rectum, bene lanceolatum, e basi ascendens, usque ad apicem supra denticulatum, dentibus septem æque dispositis, altero paulo posteriore, infra integrum, ciliatum, rectum. Dorsi carapacis dimidium posticum non carinatum nec sulcatum. Pedes 2di 3tiique subæqui. Maxillipedes externi longi, pubescentes. Segmentum caudale utrinque minutè armatum. Flagella antennarum internarum brevissima, articulum ultimum parce superantia.*

Carapax and abdomen covered throughout with a very short velvety coat. Beak straight, lanceolate, somewhat ascending from its base, dentate to apex, seven teeth equidistant, and one more posterior, below entire, straight, ciliate. Beak of carapax not carinate nor sulcate in posterior half. Feet of second and third pairs subequal. Outer maxillipeds long, pubescent. Caudal segment armed with minute spinules either side. Flagella of inner antennæ very short, but little longer than last basal joint.

Plate 40, fig. 4, animal, twice the natural size.

Dredged at Lahaina, Sandwich Islands.

Length, one and three-fourths inches. The eyes are quite large, but have a short base. The outer maxillipeds reach to apex of basal scale of outer antennæ.

PENÆUS INDICUS, *Edwards.*

Singapore.

*Penæus indicus*, EDWARDS, Crust., ii. 415.

P E N Æ U S M O N O C E R O S, *Fabr.*

Plate 40, fig. 5, outline of carapax, natural size.

Singapore ?

Length of body, three and one-eighth inches; of abdomen, two inches.

*Penæus monoceros*, FABRICIUS, Suppl., 409; EDWARDS, Crust., ii. 415.

## P E N Æ U S T E N U I S.

*Rostrum supra multidentatum (dentibus novem vel pluribus), parce sinuosum. Carapax dorso postice non carinatus nec sulcatus. Oculi sat longi. Flagella antennarum internarum subæqua, carapace vix breviora.*

Beak slightly sinuous, above multidentate (teeth nine or more in number). Carapax not carinate nor sulcate on posterior half of back. Eyes rather long. Flagella of inner antennæ subequal, hardly shorter than carapax.

Plate 40, fig. 6, outline of carapax and inner antennæ, twice the natural size.

Off Rio Negro, Northern Patagonia, in the Atlantic. Taken from the stomach of a fish.

Length, one and one-half inches. The specimens are all mutilated. The beak is broken, and we cannot give the character of the under margin or extremity beyond what is represented in the figure. The fifth and sixth abdominal segments are carinate above; the last is without lateral spines. Fifth pair of legs but little more slender than the preceding pair.



## PENÆUS GRACILIS.

*Gracillimus. Rostrum rectum, sat breve, oculis vix longius, supra 5-dentatum. Oculi longi, obconici. Antennarum internarum basis tenuis, longissimus, carapacem longitudine æquans. Manus pedum sex anteriorum carpo vix longior, apice parce pubescens; digiti dimidii manus longitudine. Segmentum caudale margine tri-spinulosum; lamella externa non articulata.*

Very slender. Beak straight, rather short, a little shorter than the eyes, five dentate above. Eyes long, obconical. Base of first antennæ slender, very long, as long as carapax. Hand of six anterior feet rather longer than carpus, and finger half as long as hand, a few short hairs at tip; three spinules on either margin of caudal segment; outer caudal lamella not jointed.

Plate 40, fig. 7 *a*, animal, enlarged; *b*, caudal extremity.

Sooloo Sea, twenty-five miles east of Panay. Collected, January, 27, 1842. Some sea-weed was seen floating by during the day.

Length, eight to nine lines. Nearly colourless; a little reddish about the mouth, and the bases of the thoracic and abdominal legs. Two of the five rostral teeth are on the carapax, back of the base of the beak. The eyes were directed straight forward in the specimen examined. The antennæ were mutilated, and the length of the flagella, therefore, was not ascertained. Second and third joints of base of inner pair together about as long as first joint, and third joint but little shorter than second.

Penult abdominal segment as long as two preceding, and having a few minute spines on the back of it. Last segment ligulate; apex obtuse. Outer caudal lamella a little longer than inner. Six anterior legs naked, except very short hairs on tips of hands; third pair about twice as long as first. The fifth pair was mutilated.

STENOPUS HISPIDUS, *Latr.*

Plate 40, fig. 8, animal, natural size (from Raraka).

Coral reef of Raraka, one of the Paumotu Islands; also, Balabac Passage, north of Borneo.

Length, three inches. Body, colourless, excepting bright crimson in the head, and in two broad bands across the abdomen, one covering the greater part of the second and third segments, and the other in the penult segment; also, scarlet crimson in four broad spots across the third pair of legs, one of which is at the base of the fingers; antennæ, white, and placed widespreading, as in the figure, when the animal is swimming, one of the long branches of the inner pair being directed nearly upward, the other branch, forward, while the outer pair is directed outward. Outer antennæ two and a half times as long as the body. Basal scale of outer antennæ twice as long as base of inner. The legs of the first and second pairs, and of the fourth and fifth are colourless; and they are extremely slender, much more so than in the drawings hitherto given of the *hispidus*; the third pair is about one-fourth longer than the body, fourth joint of second pair nearly twice as long as hand; fourth joint of fourth pair, twelve-jointed; and fifth joint, seven-jointed; tarsus minute.

The loss of the Raraka specimens, from which the drawing was taken, prevents our making a direct comparison between the Balabac specimens and those of the Paumotu Archipelago.

SEBA, Mus., iii. pl. 21, f. 6, 7.

*Stenopus hispidus*, LATREILLE, Règne An. de Cuv. [2], iv. 93; EDWARDS, Crust., ii. 407, and Cuv. illust., pl. 50, f. 2; A. WHITE, Crust. of the Samarang, p. 61, pl. 12, f. 6.

## STENOPUS ENSIFERUS.

*Carapax partim lævis, 2-3 sulcis obliquis intersecatus, uno validiore e dorsi medio fere ad angulum antero-lateralem producto et margine spinuloso, superficie carapacis antero-laterali spinulis armatâ; rostro ensiformi, paulo longiore quam basis antennarum internarum, fere*



*recto, apicem vix recurvato, supra 10-dentato, infra 3-dentato. Abdomen inerme.*

Carapax mostly smooth, crossed obliquely by two or three sulci, the strongest of which extends from middle of back nearly to antero-lateral angle, the margin of it spinulous; antero-lateral surface of carapax armed with spinules; beak ensiform, a little longer than base of inner antennæ, and hardly shorter than antennary scale, nearly straight, scarcely recurved at apex, ten-dentate above, three-dentate below. Abdomen unarmed.

Plate 40, fig. 9, animal, enlarged five diameters.

Feejee Islands.

Length, about half an inch. This species, like the *spinosus*, has the outer maxillipeds quite long pediform, and with only an obsolescent palpus; the body not compressed, abdomen not at all carinated, the tarsus short and bifid. The third pair of legs is broken from the specimen, and also part of the flagella of the antennæ, as shown in the figure. There is a spinule on the back, just behind the more prominent sulcus. The teeth of the beak are small and regular, being nearly equidistant, except that the posterior is a little more remote from the preceding, and the first of the teeth below is farther from the second than the second from the third. The abdominal segments near the lateral margin, have the surface a little uneven.

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#### FAMILY SERGESTIDÆ.

*ACETES INDICUS, Edwards.*

Singapore.

*A. indicus*, EDWARDS, Ann. des Sci. Nat., xix. 350, pl. 11; Crust., ii. 430.

## FAMILY EUCOPIDÆ.

GENUS EUCOPIA (*Dana*).

*Pedes quatuordecim (maxillipedibus 2dis 3tiisque pediformibus inclusis) totis palpo natatorio maximo instructis, ramo parium trium anticorum pediformi monodactylo et prehensili, parium quatuor reliquorum tenuiter vergiformi. Carapax non rostratus. Antennæ longæ, primæ flagellis duobus confectæ, et secundæ laminâ basali. Lamina caudalis externa prope apicem articulata. Oculi breviter pedunculati.*

Feet fourteen in number, the second and third pairs of maxillipeds being pediform, all furnished with a long natatory palpus; pediform branch of anterior six monodactyl and prehensile; of the following eight, vergiform. Carapax not rostrate. Antennæ long, first pair with two flagella, second with a basal lamina. Outer caudal lamella jointed near apex. Eyes on short peduncles.

The species of this genus have the habit of a Schizopod. Yet, three of the pairs of feet (corresponding normally to two pairs of maxillipeds and one pair of feet) are subcheliform. They might be arranged with the Anomobranchiata, were it not that they have the completeness of structure of the true Macroura, and differ only in the palpiform natatory appendage of the thoracic legs. There are distinct branchiæ under the carapax, and the outer caudal lamella is jointed, which characters are not found in the true Anomobranchiates.

The other generic characters may be stated under the description of the following species.

## EUCOPIA AUSTRALIS.

*Carapax fronte truncato-rotundatus, margine postico profunde excavatus. Segmentum abdominis penultimum ultimo longius, ultimum subulatum, lamellis caudalibus vix longius. Antennæ internæ externis paulo breviores, dimidii corporis longitudine, flagello uno brevi; externarum squama basalis basi internarum multo longior. Maxillipedes 2di et*



*3tū et pedes 1mi formā consimiles, sensim increscentes, articulo penultimo angustè oblongo, digito plus dimidio breviorē quam articulus precedens. Pedes reliqui gracillimi, criniti, palpo longo, natatorio.*

Carapax low rounded in front, posterior margin profoundly excavate. Penult segment of abdomen longer than the last, the last subulate, hardly longer than caudal laminae, which are equal. Inner antennae a little shorter than outer, half as long as body, one flagellum quite short (about one-third the longer); basal scale of outer antennae much longer than base of inner antennae. Second and third pairs of maxillipeds and first pair of feet enlarging regularly, and terminating alike in a narrow oblong monodactyl hand, the finger unguiform, not half as long as hand. Following feet very slender, crinite, palpus long and natatory.

Plate 40, fig. 10 *a*, animal, enlarged; *b*, inner antennae; *c*, outer antennae; *d*, under view of mouth; *e*, mandible; *f*, first pair of maxillae; *g*, second maxillae; *h*, first legs (or second pair of maxillipeds); *i*, second legs; *k*, third pair; *l*, one of posterior pairs of legs; *m*, first pair of abdominal appendages.

Antarctic Seas, latitude 66° 12' south, longitude 149° 44' east, south of New Holland; taken from the stomach of a Penguin.

Length, one inch. Carapax without a trace of a beak, but nearly semicircular in front, the semicircle terminating either side over the bases of the eyes. The sides behind are much prolonged and rounded, extending nearly to second abdominal segment, while the deep dorsal excavation exposes to view the last thoracic segment and part of the preceding. Thorax scarcely compressed. Fourth abdominal segment longer than the one preceding or following; sixth as long as fourth and fifth, and longer than seventh; seventh narrow, and gradually narrowing to a point, entire, lateral appendages of same length, inner lanceolate and obtuse, outer rounded at apex, margins ciliate, except outer margin of outer lamella.

Eyes with cylindrical pedicels, rather small.

Base of superior antennae three-jointed, rather stout, hairy on inner side, the second joint quite short, third with inner apex a little prolonged, and bearing from this apex a very slender short flagellum, consisting of oblong joints. The fourth joint, which may be con-

sidered the first of the larger flagellum, though different and distinct from any following, is quite short, and nearly as broad as the preceding. The longer flagellum is rather stout below. Scale of outer antennæ pointed, but not acute, long ciliæ on inner and apical margin, last three basal joints very slender (fig. 10 c).

The mouth organs are a pair of mandibles, two pairs of maxillæ, and one of maxillipeds. The mandibles narrow towards a dentate apex; they have a long palpus which is somewhat hairy; the last joint obtuse and hairy, and besides short pectinate, with spinules on inner side. The first maxillæ have a stout base and are narrow above, and with a tuft of short setæ at apex. The second maxillæ are broad foliaceous in several lobes, with the margin hairy. The maxillipeds have an oblong transverse base narrowing outward, bearing towards outer extremity an oblong ciliate cultriform lamella, and at inner apex a five-jointed termination, broad and compressed, the third of these five joints largest, the last narrow and acuminate; the two leave a broad oval space between them, the tips being in contact and so also the bases.

The six anterior legs have a long and narrow imperfect hand, the terminating claw folding on outer half of inner surface. Joint preceding the hand longer than the hand; this branch of the legs hairy on inner side. Natatory branch about two-thirds as long as the other, consists of an oblong basal joint, and a flexible multiarticulate extremity, which is hairy. Following four pairs very slender and long [they were partly broken in the specimen]. Branchiæ attached to base of thoracic legs irregularly foliaceous in many folds.



## ORDER II.

### CRUSTACEA ANOMOBRANCHIATA.

THE Macrourea have been described as divided into two prominent series,—one, the *Thalassina* series, which ranges up to the Paguridea, and another, the Shrimp or Caridoid series, whose highest grade is presented in the Astacoidea. Each of these series passes, by successive steps of degradation, into the Anomobranchiates; consequently, there are two corresponding series among the Anomobranchiates, The *first*, or *Thalassina* series, includes the Squillæ and their congeners; the *second*, or *Caridoid* series, embraces Mysis and other related genera.

The degradations in the species, to which we here allude, are apparent in several ways.

1. The carapax in the Anomobranchiates is never covered either side behind by the sides of the first abdominal segment, this peculiarity indicating a looser and less perfected structure in the body.

2. The two outer pairs of maxillipeds, and sometimes the three pairs, are pediform, and often are not distinguishable from the following pairs of true legs,—results of the less concentrated nervous system.

3. The branchiæ beneath the carapax are wanting; and there are either branchiiform appendages hanging externally at the base of the thoracic legs (*Euphausidæ*), or, in some cases, at the base of the abdominal legs (*Cythinæ* and *Squilloidea*); or else, there are no branchiæ, the general surface of the body performing the function of aeration (as in the *Mysinæ*, *Scaletininae*, and *Luciferidæ*).

4. The legs have generally a largely developed palpus. These palpi have a natatory form, being fringed with hairs or setæ; yet, their most important function is probably that of keeping the water in currents over the body, in order to compensate for the want of true branchiæ.

5. One or two posterior pairs of thoracic legs are at times wanting, either wholly (as in the *Luciferidæ*), or with only the branchiæ pertaining to them present (as in the *Euphausidæ*). In some species, the two posterior pairs of legs have at base a large curved plate, of which a sac or cavity is formed under the thorax for carrying the eggs (*Mysinæ*).

6. The abdominal appendages may be of the full Macroural size and number. Yet very often they are obsolete, excepting the caudal pair. This caudal pair differs from those of the Macroural type in wanting the articulation in the outer lamella; and, moreover, the two lamellæ are often very unequal, and sometimes much shorter than the caudal segment.

The above are some of the points in which the Anomobranchiates exhibit their inferiority to the Macroura.

Besides these peculiarities, there is a tendency to abnormal forms, and to a separation of a true antennary segment, and sometimes both antennary and ophthalmic segments, anterior to the thorax. In one group (*Luciferidæ*), an antennary segment forms a slender neck-like prolongation anterior to the mouth. In another (*Phyllosoma*), it is expanded into a broad leaf-like plate, and behind, it partially overlies the part of the cephalothorax which follows it. In the *Squilloids*, the ophthalmic and two antennary segments are distinctly marked.

We have alluded to two series of forms among the Anomobranchiates,—the one Caridoid or shrimp-like, and the other more related to *Thalassina* or *Callianassa*. In arranging the genera, these series are of prominent importance.

In the Caridoid series, there are two groups of nearly equal value; one the *Mysidoid*, including *Mysis* and related genera, in which the general form is shrimp-like, the body being subcylindrical, or more or less compressed, the legs and their palpi, when present, being mainly of the normal type, the palpus arising from the legs near the body; the other, the *Amphionoid*, having the body depressed or subfoliaceous, and the thoracic legs long, with the palpus arising remote from the body.



In the other series, there is only a single type, the *Squilloid*, divisible into two families upon the existence or not of a rostral segment independent of the carapax (those having this segment being of a higher grade), and the presence of large branchial appendages to the abdominal members or their obsolescence. The Amphionoid species in the first series, are analogous in depressed form to the Squilloidea.

We thus make three prime divisions or tribes of the Anomobranchiates :

- I. SQUILLOIDEA.—Pedes antici octo vel decim prehensiles, juxta aream buccalem insiti; 6 postici debiles. Corpus depressum.
- II. MYSIDEA.—Pedes nulli prehensiles, graciles, sæpius palpigeri, palpo prope corpus insito. Corpus non depressum.
- III. AMPHIONIDEA.—Pedes nulli prehensiles, graciles, longi, sæpius palpigeri, palpo corpore remoto. Corpus depressum, plus minusve foliaceum.

Among the *Mysidea*, the Lucifers have a very long, slender, antennary segment, as already stated. The species, moreover, have no palpus to the legs or but a trace of one, and in this respect, also, they show that they are an aberrant type in the tribe Mysidea.

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#### TRIBE I. SQUILLOIDEA.

THE Squilloidea embrace two families, *Squillidæ* and *Erichthidæ*, the former having the beak pertaining to a distinct segment of the body, separated by a suture from the carapax, and the latter, having it a part of the carapax. The former have abdominal branchial

appendages largely developed; and the latter have them small or wanting. The accepted genera are as follows :

## FAM. I. SQUILLIDÆ.

Rostrum suturâ a carapace disjunctum.

- G. 1. *LYSIOSQUILLA*, Dana.—Corpus laxè articulatum. Carapax lævis, antice vix angustior, perbrevis, segmentis cephalothoracis fere quinque posticis carapace non tectis. Abdomen latitudine e basi sensim increscens superficie non costatum. Segmentum caudale parce transversum, spinis duabus mobilibus posticè non armatum. Segmentum antennale partim nudum, testâ parvâ. Chelæ maximæ digitus spinis longis armatus.
- G. 2. *SQUILLA*.—Corpus sat laxè articulatum. Carapax sæpissimè costatus, subobcordatus, antice multo angustior, angulis anticis sæpius acutis, segmentis cephalothoracis fere quinque posticis carapace non tectis. Abdomen latitudine e basi fere ad medium sensim increscens, lateribus deinde sæpius parallelis, segmento postico parce transverso, spinis duabus mobilibus postice non armato. Segmentum antennale testâ raro omnino tectum. Chelæ maximæ digitus spinis longis armatus.
- G. 3. *PSEUDOSQUILLA* (*Guérin*, in Collect.)\*—Corpus strictè articulatum. Carapax lævis, valde convexus, segmentis cephalothoracis tribus posticis carapace non tectis. Abdominis segmenta parte anteriore lævia, lateribus subparallelis, segmento postico oblongo vel parce transverso, spinis duabus mobilibus armato. Segmentum antennale testâ sæpe omnino tectum. Chelæ maximæ digitus spinis longis armatis.
- G. 4. *CORONIS*.—*Pseudosquillæ* affinis. Segmentum caudale breve, valde transversum. Antennæ internæ quoad basin breviores.
- G. 5. *GONODACTYLUS*.—Digitus chelæ maximæ basi tumidus, spinis brevissimis vel nullis armatus; carpus supra obsolete denticulatus et denticulis tenuibus non pectinatè armatus.

## FAM. II. ERICHTHIDÆ.

Rostrum carapacis frons productus et non disjunctus.

- G. 1. *SQUILLERICHTRUS*, Edw.—*Erichtho* affinis. Appendices branchiales abdominis grandes. Digitus chelæ maximæ intus dentatus vel spinosus
- G. 2. *ERICHTHUS*, Lamarck. — Appendices branchiales sive parvi sive obsoleti.

\* We have seen only a figure of a species of the genus *Chloridus* of Eydoux and Souleyet (Voy. de la Bonite, pl. 5, f. 2, C. Latreillii), the description not being published. We suspect from the figure, that the group may correspond to the "Squilles Trapues" of Edwards, or the *Squillæ Parallelæ* of De Haan, *Pseudosquillæ*, above; but we wait for published statements before recognising it as a synonyme or otherwise.



Digitus chelæ maximæ non armatus. Pars cephalothoracis antica os precedens parte subsequente brevior. Carapax thoracem sæpius omnino tegens.

G. 3. ALIMA, *Leach*.—Appendices branchiales obsoleti. Digitus chelæ maximæ non armatus. Pars cephalothoracis antica os precedens parte sequente longior. Carapax thoracem sæpius omnino non tegens.

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### FAMILY I. SQUILLIDÆ.

#### GENUS LYSIOSQUILLA, *Dana*.

THIS division of the old genus *Squilla* is quite distinct in its habit from the rest of the group. In the species allied to *S. mantis* (our genus *Squilla*), the carapax is subovate, narrowing much anteriorly, with acute anterior angles, and the abdomen has its sides through the posterior two-thirds nearly or quite parallel, with the segments all more or less costate. But in this group, besides the very lax articulation of the body, the carapax is broad and short, hardly narrower anteriorly, with the angles rounded before and behind, and the abdomen widens gradually from its base, besides having the surface of the four or five anterior segments smooth. The antennary segment is but partly covered by the scale above, and in this respect the species are like the *mantis* section, and unlike the third section or *Pseudo-squilla*.

The *Squilla maculata*, *S. vittata*, and *S. scabricanda* (Edwards, *Crust.*, ii. 518, 519) belong to this genus.

#### LYSIOSQUILLA INORNATA.

*Carapax vix oblongus, lateribus arcuatis. Segmentum antennale late obovatum, acutum. Oculi grandes, basi extus unidentato. Abdomen longum, segmentis antepenultimo ad marginem posticum penultimoque ad margines anticum et posticum breviter spinulosus, segmento caudali paulo transverso, medio dorsi longitudinaliter gibboso, margine postico semicirculari, dentato, dentibus numerosis (plus viginti) et valde inæquis, margine laterali recto, minute denticulato. Digitus chelæ maximæ 9-10-spini-dentatus. Appendicum caudalium rami duo fermè æquales.*



Carapax but little oblong, sides arcuate. Antennary segment broad obovate, acute. Eyes large, base externally unidentate. Abdomen long, posterior margin of fifth segment, and both anterior and posterior of sixth, short spinous, last segment having a broad longitudinal prominence along the middle, and the posterior margin semicircular and dentate, with the teeth very numerous (more than twenty) and very unequal, lateral margin straight, minutely denticulate. Finger of large chela bearing nine or ten spines (the terminal included). The branches of caudal appendages subequal.

Plate 41, fig. 1 *a*, outline of animal, natural size; *b*, mouth; *c*, mandible, enlarged; *d*, outline of abdomen; *e*, nervous cord.

Rio Janeiro.

Length, nine or ten inches. The carapax is about as broad as long; the front is nearly transverse, but slightly excavate either side of the middle, with the middle obtuse and not more advanced than the outer angles; the posterior angles are rounded. The caudal segment has the sides parallel for half an inch and small denticulate; and then the margin regularly curves and is dentate; there are, first, three rounded emarginations, separated by acute or denticulated teeth, and then the posterior margin, which is two-thirds of an inch long, is unequally and rather crowdedly narrow dentate, with the interval between the two median teeth rounded and a little larger than the intervals near by on either side.

The buccal area is oblong triangular. The mandibles have a slenderly dentate edge, which is situated vertically just below the posterior margin of the buccal area, and also a long, narrow, triangular prolongation, which is acute and acutely serrulate. The palpus consists of three oblong joints, subequal, the second joint a little the longest. The entrance to the mouth is partly closed by an upper lip, which hangs like a curtain in front of the mandibles. The form of the nervous cord is shown in figure *e*, the figure is placed parallel to the drawing of the animal, so that corresponding parts are in the same line. The first ganglion is situated in the anterior cephalic segment, and sends one pair of nerves to the eyes, and one to each pair of antennæ. The two main cords leaving this ganglion to pass to the next, give off each a



slender nerve, just behind the first ganglion; also, two others, before reaching the second ganglion. The second ganglion consists of six distinct ganglions in close contact, and occupies a position between the five pairs of legs. Each of the component ganglions gives off a pair of cords for each of the members below, and the anterior, two pairs which pass to the mouth. There is a ganglion in each of the following segments, excepting the last, as in *Astacus*; and from each ganglion but the last, three nerves pass out on either side, one forward and outward, one upward, and one backward and outward; the first is very small, the second the largest. The last ganglion is similar to the same in *Astacus*.

This species is near *S. scabricauda*.

#### GENUS SQUILLA.

We restrict the genus *Squilla* to the species that have the abdomen more or less costate, and the carapax much narrowed anteriorly, with acute anterior angles. The carapax, moreover, is shorter than in *Pseudosquilla*; the body more lax in its articulation; the scale covering the antennary segment much smaller in proportion to the joint; the eyes longer and more salient.

In De Haan, the species of this division of the genus *Squilla* are called *Mantides* (Faun. Japon., p. 221).

#### SQUILLA RUBRO-LINEATA.

*Segmentum antennale supra planum, paulo oblongum, antice rotundatum, latere externo spinâ armatum. Oculi parvuli subreniformes, pedunculo subcylindrico. Carapax quinque costis ornatus, angulis anticis acutis parce productis. Margines laterales segmentorum thoracis 3 posteriorum integri, segmento precedente utrinque acuto. Digitus chelæ maximæ 6-spinosus. Abdomen superficie 8-costatum, costis segmentorum 4 anticorum postice nullis acute productis, segmentorum 5ti 6tiq; costis lateralibus postice acutis, segmenti 6ti totis posticè acutis. Segmentum caudale medio acute carinatum, superficie nec sulcatâ nec punctatâ, spinis marginum octo longioribus acutis, inter duas medianas*

4-6 *dentibus obtusis, inter has et proximas quatuor rotundatis. Appendix caudalis dorso 5-spinosus.*

Antennary segment above a little oblong and rounded in front, outer side with a prominent spine. Eyes small, subreniform, peduncle subcylindrical, with a prominent spine on outer side of base. Carapax with five costæ, anterior angles acute but not much produced. Lateral margins of three posterior segments of thorax entire, preceding segment acute on either side. Finger of larger chela six-spinous (terminal spine included). Abdomen with eight costæ; the costæ of the four anterior segments not acute behind, six of the fifth segment acute, and all of the sixth segment. Caudal segment with a median acute ridge, and surface either side neither sulcate nor punctate. Margin with eight prominent acute spines, and between the two median, four to six rounded teeth; between those and the next, four rounded teeth. Caudal appendage with five spines on dorsal margin (the apical included).

Plate 41, fig. 2 *a*, animal, natural size; *b*, part of hand of larger pair.

Rio Janeiro.

Length, six inches. Colour, green, more or less clouded with yellow and passing into blue; margin of abdomen either side, white; linear ridges of carapax and abdomen, carmine; extremity of large hand, blue, and basal joints, green. Of the five costæ of the carapax the inner and two outer are nearly as long as the carapax; the latter are near the lateral margin of the carapax; the middle one is not distinctly furcate near the front. The inner of the spines of the finger is hardly half as long as the next. The hand has three moveable spines near its base, the median half as long as either of the others; the upper edge is evenly denticulate; the carpus has a short obtusish tooth at apex; the arm is obtuse and rectangulate at lower apex. The eyes are rather shorter than the first of the basal joints of the inner antennæ; and the last of these basal joints is the longest. The small epimeral piece of the first abdominal segment is flat and has its surface nearly bisected obliquely by a straight slender ridge.

This species is near *Squilla dubia*.



## SQUILLA PRASINO-LINEATA.

*Segmentum antennale parce oblongum et antice rotundatum, partim supra carinatum, extus laminâ integrâ instructum. Oculi grandes, et pedunculi valde compressi. Carapax 5-costatus, angulis anticis breviter acutis. Margines laterales segmentorum thoracis 3 posteriorum integri. Digitus chelæ maximæ 5-spinosus. Abdomen superficie 8-9-costatum, costâ medianâ partim obsoletâ, costis externis totis postice acutis, proximis segmentorum 2di et sequentium postice acutis, 5ti 6tique totis postice acutis. Segmentum caudale medio acute carinatum, superficie sulcis obsolete ornatâ, marginibus prominenter 8-spinosis, inter spinas medianas 4-rotundato-lobatis, inter has et proximas 6-8-acuto-dentatis, dentibus basi valde gibbosis. Appendix caudalis dorso 9-spinosus.*

Antennary segment sparingly oblong and rounded in front, in part carinate above, either side furnished with a lamina having an entire margin. Eyes large and peduncles very broadly compressed. Carapax 5-costate, the anterior angles short acute. Lateral margins of three posterior segments of thorax entire. Finger of large chela 5-spinous. Abdomen with eight to nine costæ, median costa in part obsolete, outer costæ throughout acute behind, the next acute behind in all the segments except the first, and on the fifth and sixth segments all the costæ acute behind. Caudal segment acute carinate along middle, surface either side faint sulcate, margin with eight prominent spines, between the two median four rounded lobes, between the median and the next spines, six to eight acute teeth, the teeth being prominently gibbous above at base. Outer margin of caudal appendage nine-spinous (apical spine included).

Plate 41, fig. 3 *a*, part of abdomen; 3 *b*, eye; 3 *c*, part of hand.

Rio Janeiro.

Length, four and a half inches. Colour, green; of ridges, bluish-green. The middle costa of the carapax is not distinctly furcate near the front, but towards posterior margin opens for a short distance.

The denticulations of the hand are very even; the carpus is without a tooth at apex, and the preceding joint, or arm, is obtuse, and not prominent at lower apex.

*SQUILLA ORATORIA*, *De Haan*.

Singapore.

Length of body, five inches. De Haan states as a prominent distinction between this species and the *M. mantis*, that the two segments of the thorax preceding the last have either lateral margin strongly bilobate, while they are entire in the Mediterranean species. The preceding segment is bispinous either side, the two spines in nearly the same plane, and the anterior long and flexed directly forward. The outer costæ of all the abdominal segments are spini-acute behind, the next either side are acute on all but the first segment, and the next on all but the first two, while the median pair are acute behind on all but the first three. The punctate sulci on the surface of the caudal segment are quite decided; the denticles between the spines of the margin are rounded at apex, the median are six in number, three either side of a median incision, the next series eight to nine, and gibbous above at base. The finger of the large chela has six spines, the hand is evenly denticulate on margin; the carpus has two short obtusish teeth on outer margin; the preceding joint or arm is acutely produced at lower apex. The antennary segment has a lamina with entire margin on its outer side, and not a spine. The dorsal margin of either caudal appendage has nine moveable spines. The inner branch is shorter than the long furcate spine of the base.

*Squilla mantis* auctorum, partim.

*Squilla oratoria*, DE HAAN, Faun. Japon., 223, pl. 51, f. 2.

*Squilla affinis*, BERTHOLD, Rept. aus Neu Grenada und Crustaceen aus China. Göttingen, 1846, p. 26, pl. 3, f. 1, 2.

GENUS PSEUDOSQUILLA.

Besides the stiffer body, smooth abdomen (excepting two or three posterior abdominal segments), longer carapax, less narrowed before



and less acute at the anterior angles, and smoother and more even in surface than in *Squilla*; the eyes are but little salient beyond the antennary segment, and this segment is well covered by the scale appertaining to it. Moreover, the sides of the abdomen are nearly parallel. The last segment is either slightly oblong or slightly transverse, and not as short as in *Coronis*. In the smoothness of the body the species resemble those of *Lysiosquilla*; but the articulation is less lax, the shell of the antennary segment is very much larger, it quite covering the segment, the eyes have much shorter peduncles, being but little exsert.

The species of this genus have two moveable spines on the posterior margin of the caudal segment. There are some, however, as the *Squilla empusa* of De Haan (Faun. Japon., 224, pl. 51, f. 6; not *S. empusa* of Say), in which the moveable spines are wanting, and which may, therefore, properly form a distinct genus or, at least, subgenus.

The *Pseudosquillæ* have the general habit of the *Gonodactyli*, and form the transition between the *Squillæ* and that group.

#### PSEUDOSQUILLA LESSONII (*Guérin*), *D.*

Callao Roads.

Length, five inches. The number of spines on the dorsal margin and apex of the penult joint of the caudal appendages is ten; the apical is twice as long as the next preceding, and nearly as long as the last joint. The antennary plate covers entirely the joint, and the eyes are but little exsert beyond it.

*Squilla Lessonii*, GUERIN, Voy. de la Coquille, pl. 4, f. 1.

*Squilla monoceros*, EDWARDS, Crust., ii. 526.

#### PSEUDOSQUILLA STYLIFERA.

Plate 41, fig. 4 *a*, animal, natural size; *b*, *c*, antenna; *d*, larger hand; *e*, hand of second pair.

Sandwich Islands; Feejee Islands, about coral reefs of Vanua Lebu.

Colour, grass-green; eyes, brownish. Length, three inches. The specimens here referred have five prominent costæ on the caudal segment, besides two less distinct adjoining the median one. Just inside of the base of the outer of these costæ, between it and the next, there is a small tubercle. The moveable spines of the posterior margin of this segment are slender; and between these spines and the next spines, as well as between these last and the next, there are two unequal lobes, the outer quite small and tooth-like. The outer margin of the caudal appendage bears seven or eight moveable spines, besides a long apical one, which is but little shorter than the oval plate which forms the extremity of these organs.

The hand has the inner margin fine denticulate, and armed with three moveable spines. The anterior pair of feet terminates in a hand, with a small finger.

We suspect that this species is identical with Owen's *S. ciliata* (Voy. Blossom, pl. 27, fig. 5); although, in his description, he makes the anterior feet "terminate in a flattened oval plate, *unarmed* and ciliated."

#### GENUS GONODACTYLUS.

##### GONODACTYLUS TRISPINOSUS, *White*.

Feejee Islands.

Length, one and a half inches. A longitudinally corrugate penult abdominal joint,—a slightly oblong caudal segment, having three rounded prominences, and the surface corrugate towards the posterior margin, which margin is but sparingly lobed,—and the three spines of the antennary plate, one at middle, and one at either angle, are characteristics readily distinguishing this species.

*G. trispinosus*, A. WHITE, Voyage of Erebus and Terror, pl. 5.

##### GONODACTYLUS CHIRAGRA (*Fabr.*), *Latr.*

Plate 41, fig. 5 *a*, specimen from Tongatabu; 5 *b*, hand.

Tongatabu; Feejee Islands; Balabac Straits, north of Borneo.



Largest specimen in the collections, three and a half inches in length. The colour is pale yellowish, with veinings and blotches of bright green.

*Squilla chiragra*, FABR., DESMAREST, Crust., 251, pl. 43.

*G. chiragra*, LATR., Encyc. Meth., x. 473, pl. 325, f. 2; EDWARDS, Crust., ii. 528.

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## FAMILY II. ERICHTHIDÆ.

### GENUS ERICHTHUS.

THE prominent distinction laid down by Milne Edwards for distinguishing *Alima* and *Erichthus*, is the different length of the carapax; in the former, the carapax covering only part of the thorax, while in the latter, it covers the whole thorax and one or more abdominal segments. But both this character and that based upon whether the ophthalmic and antennary segments are under the beak or not, afford no good distinction. The third species of *Erichthus* here described (*E. spiniger*) has the carapax shorter than the thorax, and, therefore, is an *Alima*, according to the accepted characteristic. Yet it more closely approaches *Erichthus* in its general stout form. Moreover, it has the anterior part of the cephalothorax preceding the mouth shorter than the following portion, quite unlike the true *Alimæ*. We have therefore based our characteristic more upon the length of the anterior portion of the cephalothorax, which is certainly of more importance than the length of the carapax,—an appendage that varies much in length in many genera, and especially in the tribe under consideration. The form of the anterior part of the cephalothorax is very long and slender in *Alima*, and short in *Erichthus*,—much longer than the part posterior to the mouth in the former, and much shorter in the latter. We believe this course more true to nature, than the instituting a new genus "*Alimerichthus*."

The species of *Erichthus* differ much with respect to the spines of the carapax. The following is a list of those known:

1. *Species with a medio-dorsal spine, either on the posterior margin or more or less remote from it.*
- a. Having a large medio-lateral spine.
1. Medio-post. spine stout, carapax short. 1. *E. ACULEATUS*, *Edw.*
  2. Medio-post. spine stout, carapax long (to fifth joint of abdomen). 2. *E. TECTUS*, *Edw.*
  3. Medio-post. spine small, very remote from posterior margin. 3. *E. EDWARDSII*, *E. & S.*
- b. Having a small medio-lateral spine.
1. Medio-post. spine small, marginal. 4. *E. VITREUS*, *Desm.*
  2. Medio-post. spine small, distant from margin. 5. *E. LEACHII*, *E. & S.*
- c. Having no medio-lateral spine.
1. Medio-post. spine stout; post. margin straight.
    - \* Post. margin of carapax over fourth abdominal segment. 6. *E. TRIANGULARIS*, *Edw.*
    - \*\* Post. margin hardly reaching abdomen. 7. *E. SPINIGER*, *Dana.*
  2. Medio-post. spine stout; post. margin at middle excavate. 8. *E. ARMATUS*, *Leach.*
  3. Medio-post. spine small; post. margin straight.
    - \* Latero-post. spines divergent, long. 9. *E. 6-SPINOSUS*, *E. & S.*
    - \*\* Latero-post. spines parallel; carapax to fifth abdominal segment. 10. *E. ARMATUS*, *E. & S.*
2. *Species without a medio-dorsal spine.*
- a. Having a posterior medio-dorsal tubercle near or on margin.
1. Rostrum more than twice as long as inner antennæ. 12. *E. LONGICORNIS*, *Edw.*
  2. Rostrum very short, not longer than inner antennæ. 13. *E. DUVAUCELLII*, *Guér.*
- b. Without a medio-dorsal tubercle.
1. Latero-anterior spines large. 14. *E. PYRAMIDATUS*, *Edw.*
  2. Latero-anterior spines small [sides of carapax nearly parallel].
    - \* Carapax not covering any abdominal segments; caudal segment oblong. 15. *E. NARWAL*, *Guér.*
    - \*\* Carapax covering first abdominal segment; caudal segment not oblong.
      - † Penult abdominal segment with two small teeth. 16. *E. LATREILLII*, *Guér.*
      - †† Penult abdominal segment without teeth. 17. *E. GUERINII*, *E. & S.*
    - \*\*\* Carapax covering more than two abdominal segments. 18. *E. PALLIATUS*, *Dana.*



## ERICHTHUS PALLIATUS.

*Carapax latus, ad segmenti abdominis 3tii medium productus posticè non latior, lateribus subito deflexus, dorso paululo convexus, fere planus, angulis anticis acutis, posticis longè productis ad usque segmentum caudalem et acutis; margine inferiore integro, ad medium breviter uni-spinigero, posticè acuto, margine postico inermi, recto, rostro tenui, antennis internis paululo longiore. Abdomen 6-articulatum. Segmentum abdominis posticum paulo transversum, posticè latè truncatum, emarginatum, spinulis pectinatum, angulis acutè productum, lateribus acutè bi-dentatum. Branchiæ parvulæ.*

Carapax broad, reaching to middle of third abdominal segment, not broader behind, sides bent downward; back a little convex, nearly flat; anterior angles acute; posterior angles produced, even as far as caudal segment, acute; lower margin entire, at middle a small spine, and posteriorly acute; posterior margin unarmed, nearly straight; beak slender, slightly longer than inner antennæ. Abdomen with six segments; last a little transverse, broad truncate behind, emarginate at middle and angles produced, slender acute, sides with two teeth. Branchiæ small.

Plate 41, fig. 6 *a*, animal, enlarged; *b*, dorsal view, natural size; *c*, buccal area and organs; *d*, last joint of first pair of feet; *e*, hand of one of the short cheliferous legs.

Atlantic, latitude 6° south, longitude 24° west. Collected at 4 A. M. November 8, 1838.

Length, one and one-eighth of an inch; breadth of carapax, one-third of an inch. Colourless, excepting on the edges of some of the segments and joints of some of the legs, which had a blue tinge. Perfectly transparent.

The posterior margin of the carapax is without spine or tubercle, and the surface anterior to the margin is unarmed. The ophthalmic and two antennary segments are each distinctly separated by a suture, and are situated beneath the general carapax. Abdomen broad, gra-

dually widening to the last segment, about one-third as long as broad, excepting last, which is a little shorter than its breadth. This caudal segment corresponds to two normal segments, and a suture near its base marks the separation.

Eyes large, obconical. The inner antennæ have a three-jointed base bearing three branches, one of which branches arises from the basal portion of the shortest and stoutest branch. This short branch is not as long as the common base; it is furnished with hairs on one side; the other branches are a little longer than the base, but do not extend beyond the apex of the beak. First joint of base longer than the other two. Second antennæ three-jointed; the last an oval ciliate plate. Branch very slender, appended to basal joint; consists of two joints and a multiarticulate extremity. Mouth small. Epistome subtriangular with strongly arcuate sides. Maxillipeds consist of a basal joint bearing three joints; the first of which is broad, and but little longer than the breadth, the last quite narrow, and all setose on the inner margin. Mandible coarsely dentate.

First pair of legs slender; second joint longest, about equal to last three; last shortest and ending in a short claw. Second pair with the third joint longer than second. Finger long, nearly straight, extending nearly to base of hand, inner margin entire. Hand of next three pairs rhombic. Lamellæ at base of these and the two pairs preceding nearly circular, largest on anterior pair, and smallest on the posterior. No appendage to fourth thoracic segment. Those to fifth, sixth, and seventh segments very slender and imperfect, and attached to the segments on their sides or quite laterally.

Abdominal legs five pairs. Both lamellæ two-jointed. A minute lobed appendage, branchial in character, near inner base of outer lamella, and a short slender appendage to inner base of second joint of interior lamella.

This species is near the *E. Guerinii* of Eydoux and Souleyet (Voy. de la Bonite, pl. 5, fig. 32).

#### ERICHTHUS VESTITUS.

*E. palliato affinis, carapace segmentoque caudali similis. Carapax usque ad segmentum abdominis penultimum productus, posticè non latius, angulis posticis longè acutèque productus, margine postico recto, ad medium spinâ parvâ acuto, margine inferiore medium inermi, an-*



*gulis anticis rotundatis et non acutis. Segmentum abdominis posticum latere tridentatum.*

Near *palliatus* in general form of carapax and caudal segment. Carapax prolonged to penult segment of abdomen, not broader behind, posterior angles long and acutely produced, hinder margin straight and transverse, and armed at middle with an acute spinule; lower margin unarmed at middle; anterior angles rounded and not acute. Caudal segment with three teeth on either side.

Plate 41, fig. 7 *a*, animal, enlarged, dorsal view (young and but partly matured); *b*, first pair of antennæ, immature; *c*, second pair, ditto; *d*, one of the three posterior pairs of legs.

South Atlantic, latitude 25° south, longitude 44° west. Collected, January 10, 1839.

Length, one-tenth of an inch. Colourless. The specimen is a young, immature individual, and it is uncertain, therefore, how far the existing characters are those of the mature animal. In the three teeth on the sides of the caudal segment, the spinule of the posterior margin of the back, and other characters, it differs from the *palliatus*. The absence of a medio-lateral spine distinguishes it from the *Guerinii* and *Edwardsii*. The beak is long and straight. The carapax is slightly convex on the back, but bends down either side, and has nearly the same form as in the *palliatus*. Its posterior margin passes over the fifth abdominal segment, and the prolonged angles behind reach nearly to middle of caudal segment; but the segments of the abdomen are but partly developed, and its appendages below are wanting, excepting a rudimentary fifth pair, whence we may infer that in the adult, the abdomen may extend farther behind the carapax. The caudal segment is widest posterior to middle, and the apical margin (which is transverse and spinulous) is much longer than the basal. The anterior thoracic legs are not developed. There are five successive pairs of legs, nearly similar in form, the last three pairs of which are quite similar, consisting of a two-jointed base with a furcate termination, the branches equal, one-jointed, setose. The pair preceding these has one branch much the larger, though scarcely longer.

The anterior antennæ are thrown forward, but only the terminal setæ are seen in a back view. Three cylindrical joints were observed, the last longest and somewhat clavate, and terminating in several longish hairs. The posterior antennæ are cylindrical, three-jointed, and terminate in a few hairs. Segments to which the eyes and antennæ belong, not distinctly separate.

The animal frequently throws its abdomen forward along its venter towards the head, and shows that the body is not attached to the carapax, except near its head.

ERICHTHUS SPINIGER.

*Carapax posticè latior, convexus, segmentum thoracis posticum non omnino tegens; angulis posticis longissimè productis et latè divaricatis, infra ad processus basin spinulâ acutis; margine postico rectiusculo, simplicissimè arcuato, ad medium spinâ crassâ valde elongatâ armato; margine laterali medio inermi; angulis anticis spinâ breviter acutis; rostro elongato, antennis anticis longiore. Segmenta abdominis 5 antica subæqua, lateraliter et medio dorsi spinulâ armata; sextum dimidio brevius, medium dorsi spinulis duabus armatum; ultimum paulo transversum, posticè latè truncatum et minutè spinulosum, emarginatum, angulis productis acutis, lateribus tridentatis. Appendices caudales longi, parte furcatâ attenuatâ, longiore quam cauda, furcis valde inæquis.*

Carapax broader behind, convex, extending to middle of last segment of thorax; posterior angles long produced, and widely divaricate, and below base of process, a small spine or spinous process; posterior margin simply arcuate across, and bearing at middle a stout and very long spine; lateral margin without a medial spine; anterior angles prominently acute; beak long, longer than inner antennæ. Five anterior abdominal segments subequal, armed with a small spinous process on either side, and another at middle of back; sixth segment separate, half shorter than preceding and having two spines on back; last segment a little transverse, posteriorly wide truncate, minutely spinulous, emarginate at centre, and angles acutely produced, on the sides three small teeth. Caudal



appendages as long as segment, or exceeding it in length, furcate part attenuate, the two processes very unequal.

Plate 42, fig. 1 *a*, animal, enlarged; *b*, young of same; *c*, caudal segment of young individual.

South Atlantic, between Rio Janeiro and Rio Negro. Collected, January, 1839, at 5 A. M.

Length, five-eighths of an inch. Colourless; but two small greenish spots in abdomen near its extremity. Carapax not half as long as body; posterior medial spine long and stout; none between this and those of the posterior angles, which are long and divergent. Beak with a few minute spinules below. In the denticulations on lateral margin of caudal segment there is a minute spine. Antennæ much shorter than the beak; inner branch five-jointed and a little the longest. Second or largest pair of legs with finger very nearly as long as hand. The hand has a stout spine on the margin quite near its base, and then an emargination into which the extremity of the finger closes; the palm is set with minute spinules. Eyes short obconical; bright green reflections from the pigment within.

Figure 1 *b*, represents a half-grown individual, probably of the same species. The carapax is very similar in form and in its spinous processes. The abdomen has the row of dorsal spines, but they are obtuse and appressed to the back, and the lateral spine is wanting. The beak is not spinulous below. The caudal segment is broadest posterior to the middle, instead of anterior to the same, and thus has a similar mark of immaturity with our specimen of *E. vestitus*. This segment is deeply triangulato-excavate posteriorly, and has the posterior margin pectinate with spinules; on each side there are three denticulations, but they are obsolescent. The third, fourth, and fifth pairs of feet are rudimentary; they consist of a short cylindrical joint. The three posterior thoracic pairs are also rudimentary. The abdominal appendages are full grown, excepting the caudal pair, which consist of the basal portion alone, and this is a little shorter than the caudal segment. Eyes with bright green reflections; not as conical in the pedicels as the adult. Length, one-fifth of an inch. Colourless.

Found with the preceding.

GENUS ALIMA, *Leach.*

## ALIMA ANGUSTA.

*Corpus angustissimum. Pars cephalothoracis antica parte sequente plus duplo longior. Abdomen gracillimum, segmentis valde oblongis, ultimo triplo longiore quam latiore, posticè angustiore, dentibus posticis quatuor approximatis et uno laterali; appendicibus caudalibus brevissimis segmento quadruplo brevioribus. Carapax fere linearis, ad segmentum thoracis antepenultimum productus, posticè paululo latior, angulis posticis tenuissimè productis ad abdomen non prolongatis, margine postico bene transverso; medium rotundatè emarginato non reflexo nec spinulâ armato, spinulâ mediâ margine paulo remotâ; angulis anticis spinâ acutis; margine laterali spinulis minutis seriatis infra armato. Segmenta abdominis lateraliter spinâ armata. Basis antennarum internarum rostro valde longior, ramis tenuissimis, uno longiore quam basis.*

Body very narrow elongate. Anterior part of cephalothorax more than twice as long as following part. Abdomen very slender, segments much oblong, the posterior three times as long as broad, narrower posteriorly, four posterior teeth approximate, and one on either side. Caudal appendages very short, four times shorter than the segment. Carapax nearly linear, slightly broader posteriorly, extending to antepenult thoracic segment; posterior angles very slenderly produced, but not prolonged to line of abdomen; posterior margin directly transverse, with a rounded emargination at centre, but not flexed upward nor armed with a spinule, the median spinule being a short distance from the margin; anterior angles slender spini-acute; segments of abdomen with a spine on either side. Base of first antennæ much longer than beak, branches very slender, the longer exceeding the base in length.

Plate 42, fig. 2 *a*, animal, enlarged; *b*, under view of mouth and feet about it; *c*, maxilliped; *d*, termination of one of the short feet near the mouth; *e*, one of the six posterior thoracic feet; *f*, one of the abdominal feet.



Atlantic ; latitude  $2\frac{1}{2}^{\circ}$  north, longitude  $17\frac{1}{4}^{\circ}$  west. Collected, October 29, 1838, at 4 o'clock, A. M.

Length, one and three-eighths inches; breadth of carapax, one-fifth of an inch. Whole body pellucid and colourless, except a reddish tinge on posterior margin of last segment of body, and two or three spots about the segments of the abdomen. Beak of carapax slender and naked. Spinous process of anterior and posterior angles very slender, appearing to be a continuation of the corneous edge of the carapax; a few short spines on these processes. Posterior margin of carapax very nearly straight transverse, excepting the emargination at centre. The breadth of the emargination is slightly greater than that of the segment below, or about one-quarter that of the whole margin itself. Median spinule situated as far from the margin as the breadth of the emargination.

The ophthalmic segment is separated from the antennary by a distinct suture, and the two antennary are also distinct. The eyes have very slender peduncles, a little curving, with spheroidal or obconical extremities. The pigment is dark green, nearly black. The anterior antennæ have a three-jointed base; first joint a little the longest. Of the three branches, one, the largest in diameter, has longish ciliæ on one side, and is shorter than the base of the antennæ; the others are very slender and longer than the base. The intermediate branch consists of seven joints, which are rather long excepting the last, which is quite short. The second antennæ have a slender jointed appendage at base of second joint. The oval plate terminating the organ is narrow elliptical and ciliated; it is longer than the two preceding joints together.

The maxillipeds consist of three joints on a short base, the first two broad, the last narrow, and all edged within with hairs or setæ. Mandibles brownish red and corneous, toothed at extremity.

First pair of legs very slender, extending forward nearly to base of second antennæ, five-jointed. Basal joint short. Second pair of legs with a long narrow hand, broadest a short distance from apex and gradually narrowing to a slender base. An emargination on the outer side, about one-third the distance from the base to the apex, into which the extremity of the finger shuts; and two spines just above this emargination. Minute spinules or denticulations on the inner margin of the finger. Following three pairs of legs

small, the posterior smallest. Hand broad and finger as long as hand. Last three pairs of thoracic feet rudimentary, consisting of a basal joint and a bifid extremity, which is naked and hardly appears to be articulate. The segments of the body to which these organs severally pertain were all distinct, excepting those belonging to the mouth organs and first pair of feet, which appeared to be united in one. The last four segments of the thorax are very slender, the diameter being less than one-third the length.

Abdominal segments all narrow oblong, gradually enlarging posteriorly; a spine from posterior part of each, laterally. Last abdominal segment lamellar, distinctly composed of two segments, a suture near its base marking the junction of the two. This segment is broadest at middle and anteriorly; the two lateral teeth are just below the middle, the other four teeth are all on the posterior margin, and are quite near together, and the margin intervening is minutely denticulate. The abdominal feet consist of two oblong lamellæ on a common base, each plate jointed, one near base, the other below middle, and both are ciliate. No branchial appendages were observed.

This species is near the *hyalina*. But according to Leach's figure (Voy. of Capt. Tuckey to the River Zaire), the *hyalina* has the abdominal segments hardly oblong, while in our species they are more than twice as long as broad, and the medial posterior spine of the carapax is marginal, and this margin is bent upward, which is not the fact with the *angusta*. The proportions vary correspondingly in other respects. The base of the superior antennæ, moreover, is sparingly longer than the beak in the *hyalina*.

It differs from the *gracilis* in having the medio-dorsal spine just back of the posterior margin instead of on the margin, in its more slender filiform arms, its spinule on the spinous prolongation of the posterior angles of the carapax (see Edwards's figure, in Cuv. Règne An., pl. 57, f. 3).

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#### APPENDIX TO SQUILLOIDEA.

WE append here a description of a few young individuals, which probably belong in this group, among the Schizopoda.



## ERICHTHINA DEMISSA.

*Carapax latus, latitudine paulo longior, posticè paulo angustior, rostro longo et crasso, deorsum valde inflexo, nudo, margine carapacis postico sinuoso, medium spinâ brevi acuto, angulis posticis breviter acutis, margine antero-laterali rotundato, non acuto, laterali integro.*

Carapax broad, a little oblong, a little narrower behind, beak long and stout, flexed very much downwards, naked, posterior margin of carapax sinuous, at middle acute with a short spine, posterior angles short acute, antero-lateral margin rounded, not acute, lateral margin entire.

Plate 42, fig. 3 *a, b, c*, different views, enlarged; *d*, still younger individual of the same.

Near eastern entrance of Straits of Sunda. Collected, March 3, 1842.

Length of individual represented in figures *a, b, c*, about one-sixteenth of an inch; of that of fig. *d*, one-twenty-fourth of an inch. The legs are only partly developed, and none are cheliform. The first antennæ in the largest specimens, simple, consisting of a short basal joint, a second joint rather long, and three short apical ending in a few setæ. The second pair are two-branched, one branch multiarticulate and setigerous, the other two-jointed. The legs of the last thoracic segment were not at all developed, of the five pairs next preceding rudimentary, the posterior largest; two preceding pairs bifid and subnatatory; the branches two-jointed and furnished with a few setæ. Preceding these, two pairs appear to correspond to maxillæ and maxillipeds. The eyes were large and compound, but were wholly covered by the shell. The abdomen was long linear seven-jointed, the sixth a little longer than preceding, the seventh twice as long as sixth and short bilobate behind, with a number of divergent setæ on the margin. Caudal appendages about as long as caudal segment.

In the younger state (fig. 3 *c*), the segments of the abdomen were distinctly separated; there were no compound eyes and only a minute

central point near the front, as in the Caligi; the mandibles, maxillæ, maxillipeds, and two pairs of bifid legs were distinct, but no rudiments of those posterior, neither of any abdominal appendages.

The four antennæ were nearly as in the preceding, except that the first pair were three-jointed, the last not being subdivided, and the multiarticulate branch of the second pair consisted of but four joints.

## TRIBE II. MYSIDEA.

A SHRIMP-LIKE form and habit is strongly retained through all the genera of Mysidea. There is, however, a slight prolongation of the head in the Sceletininae, and a constriction of the carapax, across just anterior to the mouth; and this aberrant feature is excessively developed in Lucifer, where a long, slender segment precedes the mouth, reminding us of the same in Alima. The species of Lucifer still retain much of the Caridoid habit in the thorax and legs, and are Mysidean; while those of Alima, true Squilloids, besides having a carapax over the whole cephalothorax, are characterized by the prehensile legs of the Squillæ and Erichthi.

There is a wide range among the species as to the legs, although they are never prehensile, and also as to the branchiæ. The thoracic legs are either bifid, with a long ciliated outer branch, or they are simple or undivided; they are either complete in the normal number, or one or two posterior pairs are obsolete. The first, second, and third pairs of maxillipeds are more or less pediform, and they may be either like the following legs, or the third alone may be thus similar to the legs in form and direction.

The differences in the branchial function are of a striking character. In the higher species, approaching most nearly to the Macroura, there are thoracic branchial appendages, uncovered by the sides of the carapax, hanging in branching tufts or clusters of closed vessels from the outer side of the base of several of the legs. In the greater part of the species, such branchial appendages fail entirely, and this func-



tion is performed by the general surface of the body; in a few species only, certain abdominal appendages appear to take part.

The existence or non-existence of thoracic branchial appendages marks the higher and lower grades of Mysidea, and this characteristic is, therefore, a proper basis for family distinctions. Moreover, the aberrant structure in *Lucifer*, removes these species widely from the other Mysidea, the great length of the antennary segment being connected with a very short thorax and simple thoracic legs, without a natatory appendage, or only an obsolescent palpus.

There are, hence, three prominent groups or families among the Mysidea :—

Fam. I. EUPHAUSIDÆ.—Cephalothoracis Caridoideus. Pedes thoracici bifidi, appendicibus branchialibus instructi.

Fam. II. MYSIDÆ.—Cephalothoracis Caridoideus. Pedes thoracici bifidi, appendicibus branchialibus carentes.

Fam. III. LUCIFERIDÆ. — Segmentum antennale valde elongatum, carapace per suturam fere discretum. Pedes simplices.

The *Luciferidæ* are the transition species connecting the Mysidea with the *Amphionidea*, the antennary segment in the latter being expanded to an unusual size, and separated by some appearance of a suture from the following part of the cephalothorax.

The *Euphausidæ* and *Luciferidæ*, as far as at present investigated, appear to form but a single group each. The species of the former, in all cases examined by the writer, have a naked setæ either side of the extremity of the caudal segment, which often gives it a barbed extremity, with the barbs reversed. This character has not been observed in other Mysidea.

The *Mysidæ* include three groups :—

The *first* (*Cynthinæ*) with abdominal branchial appendages, in the form of a coiled membrane or plate, and the inner antennæ two-branched.

The *second* (*Mysinæ*), without branchial appendages, but with the inner antennæ two-branched.

The *third* (*Sceletininae*), without branchial appendages, and with the inner antennæ simple, and the outer two-branched without a proper basal scale.

The *Mysinæ* have a cavity formed beneath the posterior part of the cephalothorax by plates from the bases of the legs for carrying the eggs before they are fully developed.

The known genera and subdivisions of the Mysidea, are as follows :

#### FAM. I. EUPHAUSIDÆ.

- G. 1. NOCTICULA, *Thompson*.\*—Oculi symmetrici, breves. Pedes thoracis quatuordecim, duobus posticis obsoletis branchiis exceptis. Flagella duo antennarum internarum elongata.
- G. 2. EUPHAUSIA, *Dana*.—Oculi symmetrici, breves. Pedes thoracis non unguiculati, numero duodecim, quatuor posticis obsoletis branchiis exceptis. Flagella duo antennarum internarum elongata. Segmentum abdominis posticum acuminatum.
- G. 3. CYRTOPIA, *Dana*.—Oculi paulo oblongi, apice externo obliquè gibbosi, lenticulis totis in gibbositate versis. Articulus antennarum internarum primus apice *inferiore* productus. Segmentum abdominis posticum obtusum aut truncatum.

#### FAM. II. MYSIDÆ.

SUBFAM. 1. CYNTHINÆ.—Pedes abdominis appendicibus branchialibus instructi. Antennæ internæ birameæ, externæ squamâ basali instructæ.

G. CYNTHIA, *Thompson*.†—Pedes thoracis quatuordecim, biramei; maxillipedes quatuor. Oculi breves symmetrici.

SUBFAM. 2. MYSINÆ.—Pedes abdominis appendicibus branchialibus carentes. Antennæ internæ birameæ, externæ squamâ basali instructæ.

\* *Thysanopoda* of M. Edwards. The genus *Nocticula* of Thompson (*Zool. Researches*, p. 52, pl. 5, f. 1) is identical either with *Thysanopoda* or *Euphausia*, and, as he states the number of pairs of thoracic legs to be eight, it must be identical with the former. The specimens were obtained in the northern Atlantic.

† *Zoological Researches*, 55, pl. 6.



1. *Pedum rami ambo thoracorum extremitate multiarticulati.*

G. 1. *MYSIS*, *Latreille*.—Pedes thoracis duodecim, maxillipedes numero sex. Antennæ internæ flagellis duobus confectæ. Pedes abdominis parvuli, debiles.

2. *Pedum ramus internus thoracorum non multiarticulatus, bene unguiculatus. Oculi symmetrici.*

G. 2. *PROMYSIS*, *Dana*.—Pedes thoracis duodecim, maxillipedes sex. Antennæ internæ flagellis duobus laminâque oblongâ confectæ. Pedes abdominis oblongi, natatorii, longitudinem fere æqui. [Segmentum abdominis posticum emarginatum vel bilobatum.]

G. 3. *MACROMYSIS*, *White*.\*—Pedes thoracis sexdecim, inter sese similes, toti bene palpigeri. Antennæ internæ flagellis duobus laminâque oblongâ confectæ. Pedes abdominis quarti valde elongati; (an discrimen sexuales tantum.) [Segmentum abdominis posticum emarginatum vel bilobatum.]

G. 4. *SIRIELLA*, *Dana*.—Pedes thoracis sexdecim, toti bene palpigeri, posticorum duodecim ramo pediformi apicem setis brevibus mobilibus (instar digitorum) juxta unguem instructo. Antennæ internæ flagellis duobus confectæ, laminâ carentes. Pedes abdominis toti rudimentarii. [Rostrum brevissimum. Segmentum abdominis posticum apice rotundatum et spinulis ornatum.]

3. *Oculi e latere pedicelli externo obliquè spectantes, lenticulis totis parce obliquè versis.*

G. 5. *LOXOPIS*, *Dana*.—Oculi elongati. Antennæ internæ flagellis duobus confectæ, laminâ carentes. Appendices abdominis rudimentarii. [Segmentum abdominis posticum truncatum vel obtusum, extremitate spinuloso.]

SUBFAM. 3. *SCELETININÆ*.—Pedes abdominis appendicibus branchiiformibus carentes. Antennæ internæ simplices, externæ birameæ squamâ basali carentes.

G. 1. *SCELETINA*, *Dana*.—Carapax anticè acuto-tricuspidatus, paulo pone frontem instar colli constrictus, deinde ovatus posticè angustans. Oculi prælongi, obconici. Pedes thoracis elongati duodecim, biramei, ramo pediformi 4-5 articulato.

G. 2. *RACHITIA*, *Dana*.—Carapax anticè acuto-tricuspidatus, pone frontem non constrictus. Oculi longi, obconici. Segmentum abdominis sextum valde elongatum [segmentis in specie scrutatâ anticis simul sunitis non longioribus quam sextum, utroque spinam longam dorsalem gerente]. Antennæ internæ flagello longo tenuissimo confectæ.

\* *Themisto*, Goodsir, Jameson's Ed. J., xxxiii. 174, pl. 2; *Macromysis*, A. White, Cat. Crust. Brit. Mus., 1847, p. 81; *Mysidium*, Dana, Amer. Jour. Sci. [2], ix. 129, 1850.

The new genera of Mysidea, by the author, are described in the volume of the American Journal of Science here referred to.

G. 3. MYTO.\*—Pedes thoracis quatuordecim, primi secundi tertii quartique palpigeri, quinti sexti septimi simplices. Appendices caudales segmentoque caudali connati, ideoque cauda latè triangulata, margine postico longo. Flagella antennarum internarum non articulata.

## FAM. III. LUCIFERIDÆ.

G. LUCIFER, *Thompson*.—Antennæ internæ simplices, externæ squamâ basali instructæ. Pedes thoracis quatuor postici (ad segmenta normalia pertinentes xiii. xiv.), obsoleti; octo precedentiés (ix. x. xi. xii.), elongati, setigeri; deinde duo antici (viii.), instar maxillipedum flexi. Maxillipedes duo (vii.); maxillæ quatuor (v. vi.); mandibulæ (iv.) duæ non palpigeræ.

## APPENDIX TO THE MYSIDEA.

The following genera are retained provisionally for certain immature forms, which may be young of *Macroura* :—

G. PODOPSIS, *Thompson* (*Zoological Researches*, i. 59, tab. 59, fig. 1). Oculi longissimi. Antennæ internæ fere obsoletæ; secundæ laminâ instructæ. Pedes duo longissimi, articulo tenui annulato confecti; reliqui breves. Pedes abdominis natatorii.

G. FURCILIA, *Dana*.—Carapax plus minusve rostratus. Oculi aperti. Pedes abdominis bene natatorii. Antennæ internæ furcatæ, ramis (immaturis?) subæquis 1-2 articulata; segmentum abdominis posticum truncatum, extremitate sæpius spinulosum. Animalia in mari alto lecta.

G. CALYPTOPIS, *Dana*.—Carapax non rostratus, oculos omnino tegens. Antennæ internæ biramæ, ramis (immaturis?) subæquis, 1-2 articulatis. Segmentum abdominis posticum truncatum, extremitate sæpius spinuloso.

## FAMILY I. EUPHAUSIDÆ.

GENUS EUPHAUSIA, *Dana*.

*Oculi breves, orbiculati. Antennæ internæ flagellis duobus confectæ, externæ squamâ basali instructæ. Pedes thoracici numero duodecim, quatuor posticis obsoletis branchiis eorum exceptis, 6-articulati, tenues,*

\* Krøyer, *Tids. N. R.*, i. 470.



*non unguiculati, ciliati, palpo brevior. Branchiæ multipartitæ aut ramosæ. Pedes abdominales mediocres, basi oblongo, lamellis ciliatis. Segmentum abdominis posticum elongatum, acuminatum, utrinque barbâ nudâ prope apicem armatum.*

Eyes short, orbiculate. Inner antennæ ending in two flagella, outer having an oblong ciliate scale at base. Thoracic feet six pairs, the two posterior wanting, except the branchiæ; legs six-jointed, slender, not unguiculate, ciliate, palpus shorter. Branchiæ much divided or ramosæ. Abdominal feet moderately large, consisting of an oblong base and ciliate lamellæ. Last segment of abdomen oblong, acuminate, armed on either side near apex with a naked barb. ) ?.

Carapax in front with a very short beak. Peduncle of the first antennæ long, projecting far beyond the eye, and bearing two long slender flagella, of nearly equal length. Two posterior thoracic legs absent excepting the branchiæ, which are larger than the others more anterior. The pairs of branchial appendages seven in number. 3. 6

Palpus of mandible three-jointed, inserted near summit; extremity of mandible with a prominent denticulate edge around the summit.

The caudal appendages consist each of two oblong plates, nearly equal in length, and but little shorter than the caudal abdominal segment. The inner is slender acuminate and ciliate on both sides. The outer is obtuse at apex and ciliate within. The two setæ near apex of last abdominal segment give it nearly a trifurcate appearance, the setæ projecting beyond the point between.

The thoracic legs are usually carried as in the figures, while the palpi or outer branches act as oars in swimming. The legs are furnished with long ciliæ, which are short thin plumose. There are five long slender joints, the last three bent downward; the next preceding is short and stout, has a transverse position, it bears the palpus near one end, and the continuation of the leg at the other. This transverse joint proceeds from another short joint which bears the branchiæ.

The *Euphausiæ* are brilliantly phosphorescent, and hence the name of the genus; the phosphorescence proceeds from a part of the cephalothorax.

The species sometimes have a minute red globule near the base of four of the abdominal legs either side, and also two other pairs in the

cephalothorax near base of second and sixth pairs of legs (see figure of *E. pellucida*). They appear glassy under a lens, as if an eye; but we have been unable to assure ourselves of the true nature of the organ.

## EUPHAUSIA PELLUCIDA.

*Gracilis. Carapax brevissime rostratus. Articulus antennarum internarum primus apice non productus. Squama basalis antennarum externarum basi paululo longior. Pedes tenuissimi, articulo ultimo brevissimo, tribus ultimis simul sumtis precedente fere duplo brevioribus, palpo fere triplo brevioribus quam pes. Segmentum abdominis ultimum acutum, lamellis caudalibus paululo longius, barbibus subapicalibus salientibus. Branchiæ posticæ subdigitatæ.*

Very slender. Carapax very short rostrate. First basal joint of inner antennæ not produced at apex. Basal scale of outer antennæ a little longer than base. Feet very slender, last joint very short, the last three together nearly twice as short as the preceding joint, palpus about one-third the length of the leg. Last abdominal segment slender acute, slightly longer than caudal lamellæ, the two naked subapical setæ salient. Posterior branchiæ subdigitate.

Plate 42, fig. 4 *a*, animal, enlarged; *a'*, same, natural size; *b*, eye and base of first antennæ; *c*, base of second antennæ; *c'*, part of flagellum of same; *d*, mandible; *e*, maxillæ or maxilliped; *f*, maxilla; *g*, posterior thoracic leg; *h*, extremity of abdomen; *i*, abdominal leg, with red spherical gland between the two of a pair; *k*, posterior branchiæ; *l*, ovaries dissected out, partly mutilated, together with two red spherical glands in posterior part of thorax (seen in figure *a*); *l'*, part of same, natural size; *m*, *m'*, eggs from the ovary, much more enlarged.

Pacific, near northern Kingsmill Islands; April, 1841:

Length, half an inch. Colourless, or nearly so.

This is a very slender species. The carapax is not higher behind than at middle. The margins of the anterior four abdominal segments are arcuate alike. Eyes nearly orbicular. The inner antennæ



are about two-thirds as long as the body; the two flagella are subequal, the basal joints have a few short hairs at apex; the second and third joints are nearly equal. Flagellum of outer pair about as long as in first pair.

The legs have the last three joints together about half the length of joint next preceding, and the last joint is not half the penult in length. The branchiæ consist of five to eight simple narrow bursæ attached to one or two pedicels.

Mandibles subcylindrical, with apex dentate and lower side of summit prominent and denticulate, with a grinding surface. The palpus has three joints, and is furnished with a few rather long scattered hairs; the second joint is about twice as long as either of the others, and the last is obtuse. The maxilliped consists of three lamellar joints, set with spinulous setæ on the inner side.

Two ovarian bags were extruded from posterior part of thorax on pressure, which had an ear-drop shape, diminishing above to a tubular form; the tube was broken in the dissection, and not farther traced; a small globular mass of similar ovarian character lay near the head of each bag, and above, the drawing represents another large ovarian bag, which was detached and broken.

The animal contains, like another species, several pairs of minute, ruby-red spherules, as shown in the drawing, one pair near base of second thoracic feet, another in posterior part of thorax (above alluded to), and another in each of the four anterior abdominal segments. They have no connexion with the ovarian apparatus. Figure *i* represents one in a prominence at the base of an abdominal leg.

Pigment of eye, black; a deep red spot in the pedicel, a short distance back of the pigment.

#### EUPHAUSIA SPLENDENS.

*Carapax brevissimè rostratus. Articulus antennarum internarum primus apice productus. Squama basalis antennarum externarum basin non superans. Pedes tenuissimi, articulis tribus ultimis subæquis, simul sumtis vix brevioribus quam articulus precedens, setis longis breviter plumosis, palpo plus duplo brevior. Segmentum abdominis posticum lamellis caudalibus longius, barbibus subapicalibus salientibus, 6tum 5to fere duplo longius. Branchiæ posticæ ramosæ.*

Carapax very short rostrate. First joint of inner antennæ oblong and produced at apex. Basal scale of outer antennæ shorter than base. Feet very slender, last three joints subequal, and together but little shorter than preceding joint, setæ long, short plumose, palpus not half as long as leg. Last segment of abdomen longer than caudal lamellæ, the two subapical barbs salient, sixth segment about twice as long as fifth. Posterior branchiæ ramose.

Plate 42, fig. 5 *a*, animal, enlarged; *b*, extremity of abdomen; *c*, fourth pair of legs; *d*, sixth pair; *e*, posterior pair of branchiæ; *f*, first pair of abdominal legs; *g*, second pair, ditto; *h*, third pair, ditto.

Abundant in the Atlantic in latitude 2° north, longitude 17° west. October 29, 1838, at 4 A. M. There were many *Pyrosomas* floating by at the time, and few *Cyclopidæ*. Found none on the afternoon of the same day, and the morning of the day following.

Length, about half an inch. Colour, reddish about ventral parts. Carapax a little compressed, not toothed, and vertical height not much less anteriorly than posteriorly. Sixth joint of abdomen about as long as two preceding. The inner antennæ have a three-jointed base about three times as long as the eye. The flagella of both pairs of antennæ were broken in all the specimens (some fifteen or twenty) collected, so that the full length was not ascertained—they are probably not very much longer than the carapax. The ciliæ of the oblong scale of the outer antennæ are curled at apex. The branchiæ of the anterior legs consist of a cluster of small vessels, while the posterior are larger and branched, main branches three or four in number; none were observed on the first pair. The palpus or natatory branch of the legs is longest upon the anterior pairs. The main stem of these legs appears to have little lateral motion. The last three joints have a row of long plumose ciliæ on the inner side, while the preceding have two or three rows of similar ciliæ or hairs.

The two anterior pairs of abdominal legs are peculiar in form. The outer branch of the first pair is large, and has a gibbosity on the inner side, and is consequently obliquely excavate under the acute apex; the other branch is lanceolate and ciliated. The second pair somewhat resembles the first, but is more slender; there appeared to be a scale



articulated with the obliquely truncate apical margin, just under the apex, which is acute. The branches of the third pair are similar to one another though unequal in size.

At the base of each of the anterior four abdominal legs, between the two legs of each pair, there was a ruby-red, shining globule; also, one on each side at base of sixth and second pairs of thoracic legs; also a large red, or brownish red spot in the back, not far from the eyes. Several individuals were observed to emit light, and it was seen to come from the anterior part of the cephalothorax. The light was intense and had a greenish tinge.

#### EUPHAUSIA GRACILIS.

*Carapax brevissimè rostratus. Articulus antennarum internarum primus ad apicem parce productus et acutus. Squama basalis antennarum externarum basin multo superans. Pedes tenuissimi, articulis tribus ultimis subæquis simulque sumtis precedente vix brevioribus, setis longiusculis, palpo parvulo, quadruplo brevior. Segmentum abdominis posticum lamellis caudalibus non longius, 6tum 5to fere duplo longius. Branchiæ posticæ ramosæ.*

Carapax very short rostrate. First joint of inner antennæ sparingly produced and acute at apex. Basal scale of outer antennæ longer than base. Feet very slender, last three joints subequal, and together but little shorter than preceding joint, setæ longish, palpus quite small, about one-fourth as long as leg. Last abdominal segment not longer than caudal lamellæ, sixth segment about twice as long as fifth. Posterior branchiæ ramosæ.

Plate 42, fig. 6 *a*, animal, enlarged; *b*, extremity of abdomen (setules of apex probably lost by mutilation); *c*, posterior branchia.

Pacific, latitude 15° 23' south, longitude 148° 23' west. Caught one individual during a calm at 4 A. M., September 10, 1839.

Length, half an inch. Colour, reddish along the venter and in the legs. Scale of second antennæ extends beyond apex of base about as far as length of penult joint of base. The last abdominal segment

was without the two subapical naked setæ, which in other species give a barbed appearance to the extremity; but it may be that this was owing to mutilation; on the sides of this segment there were two remote minute spines. The carapax is considerably higher posteriorly than anteriorly.

## EUPHAUSIA SUPERBA.

*Carapax brevissimè acutèque rostratus. Segmentum abdominis 6tum 5to vix longius. Articulus antennarum 1marum primus apice productus et obtusus. Squama basalis antennarum 2darum basi vix brevior. Articulus pedum ultimus pertenuis, penultimo multo brevior. Segmentum abdominis posticum laminâ caudali proximâ paululo brevius. Branchiæ ramulis setiformibus instructæ, posteriores ad basin involutæ, ramis radiatis arcuiformibus instar rotæ cum ramulis prælongis subradiatim ciliatis.*

Carapax with a very short and acute beak. Sixth segment of abdomen hardly longer than fifth. First joint of inner antennæ produced at apex and obtuse. Basal lamina of outer antennæ very slightly shorter than base. Last joint of feet very slender, much shorter than penult. Last abdominal segment slightly shorter than adjoining caudal lamina. Branchiæ furnished with setiform branchlets; the posterior pair involuted at base, and having branches radiating around somewhat wheel-like, branches curving, and furnished on outer (posterior or inferior side) with long setiform branchlets, subradiate or spiral in position.

Plate 43, fig. 1 *a*, animal, enlarged two diameters; *b*, upper view of beak, eyes, and base of first antennæ; *c*, caudal extremity; *d*, under view of mouth, showing maxillipeds and extremity of mandibular palpi; *e*, mandible; *f*, maxilla; *g*, languette; *h*, shorter branch of first pair of abdominal legs; *h'*, basal portion of same pair of legs; *h''*, a process of shorter branch, more enlarged; *h'''*, ciliated natatory lamina of same; *i*, second pair of abdominal legs; *k*, basal portion of third pair of thoracic legs, with branchia and natatory branch; *l*, stomach, profile or side view; *m*, stomach, opened longitudinally above, and showing inside—the view as seen by transmitted light, the dark



parts thickest; *n*, liver and duct; *n'*, section of same; *o*, posterior branchia; *o'*, extremity of setiform branchlet, more enlarged.

Antarctic Seas, south of Van Diemen's Land, latitude, 66° 05' south, longitude 157° east, where it was obtained by Lieutenant Totten, U. S. Ship Porpoise.

Length, two inches. Colour, as noted and sketched by Lieutenant Totten, red, spotted with whitish. Body compressed, smooth, naked. Eyes large, globular, on short peduncles. Base of inner antennæ longer than base of outer; third joint shorter a little than second; flagella about half as long as the body, shorter than flagellum of outer antennæ; third joint of base of outer antennæ longer than fourth (or last); flagellum slender, naked, more than half the length of the body. Hairs of legs, as in other Euphausiæ, extremely slender.

Branchiæ attached to all the legs excepting first pair. The anterior consist of a lunate plate attached by a pedicel, proceeding from the concave side of the truncate plate at the base of the legs. The two posterior pairs of branchiæ (the legs corresponding to which are wanting) have the basal plate spirally curved (fig. *o*), and the circumference bears a series of radii, which are themselves incurved at apex, and bear each a series of slender setæ, increasing in length from behind forward. On the anterior side of the basal portion, near its insertion, there is a long slender branch, which bears branches on its sides, and these branches are furnished with a row of setiform branchlets like the other.

The first two pairs of abdominal legs are unlike the following and dissimilar. The outer branch has the usual form; the inner and smaller of first pair consists of three portions, as in figure *h*, which are generally folded together; the inner portion has the ordinary character of this branch, being an oblong ciliate lamella; the next has a short, stout hook below the apex; the third has an oblong curved process a short distance from the apex, and at the apex it bears a stout, oblong, slender organ, which appears to be tubular.

The mandibles have a denticulate apex, and a three-jointed palpus inserted near the summit. The maxillæ are broad lamellar in form, and consist of three plates, the basal largest, the whole together looking like a lobed leaf. The maxillipeds consist of four lamellar joints, and are somewhat oblong triangular in form; on the outer side

there is a narrow oblong palpus. The stomach has the form represented in figure 1, the natural size of which is given below the figure. The interior of the stomach was without teeth, but was provided with longitudinal cartilaginous ridges or plates, and had a villous surface.

GENUS CYRTOPIA, Dana.

*Carapax plus minusve rostratus. Oculi paulo oblongi, obliquè gibbosi lenticulis totis in gibbositate versis. Pedes abdominales bene natatorii. Segmentum abdominis posticum apice obtusum vel truncatum et minutè spinulosum, prope apicem barbâ nudâ utrinque armatum.*

Carapax more or less beaked. Eyes somewhat oblong, obliquely gibbous, the lenses being directed in a cluster obliquely outward into the gibbosity. Abdominal feet natatory. Last abdominal segment obtuse or truncate at apex, and minutely spinulous, armed on either side near apex with a naked oblong barb.

This genus, like Euphausia, has branchiæ attached to the bases of the thoracic legs, and the last abdominal segment has the same kind of naked setæ either side of apex. But this caudal segment is truncate at apex, and, what is of more importance, the eyes, instead of being orbicular and covered with facets, have all the facets directed in a cluster obliquely outward. The pedicels of the eyes extend straight forward parallel with the medial line, and at the same time the eye looks laterally and only so.

Two species were obtained, but the specimens of neither were adult. The inner antennæ have a long basal portion, and two flagella [the flagella were broken off near the base]. The outer were apparently rudimentary, and consisted of a rather short, three-jointed base, and two short branches.

The mandibles terminate in a dentate apex. The legs are furnished with small branchiæ; in the specimens they were more or less rudimentary or imperfect; the two posterior pairs of legs were wholly wanting excepting the branchiæ, as in Euphausia.



## CYRTOPIA ROSTRATA.

*Carapax bene acutèque rostratus, rostro oculis non breviorè, margine carapacis infero-laterali acutè uni-dentigero, postico rotundato. Segmentum abdominis ultimum extremitate subito angustatum apiceque rotundatum et minutè spinulosum, ad basin setarum subapicalium spinâ armatum; setis (vel barbis) longis apicem valde superantibus, divaricatis. Lamellæ caudales subæquæ, segmento caudali valde breviores.*

Carapax with an acute beak rather long (as long as the eyes), bearing an acute tooth somewhat posteriorly on the lateral margin, rounded behind. Last abdominal segment abruptly narrowed at extremity, and the small apex rounded and set divergently with spinules; a spine also at outer base of subapical setæ; these subapical setæ extending much beyond the apex of the caudal segment and divergent. Caudal lamellæ subequal, very much shorter than the caudal segment.

Plate 43, fig. 2 *a*, animal, enlarged; 'b, caudal extremity.

Pacific, Kingsmills Group, near Pitt's Island. Collected, April 30, 1841.

Length, one-third of an inch. Colourless. The beak is quite long and acute. The carapax is not excavate behind across the dorsum. The caudal lamellæ are about three-fourths as long as caudal segment, and the setæ projecting and divergent give it a sagittate appearance. These setæ or setiform processes extend full half their length beyond the apex of the segment; and there is a spine on each side of the segment just exterior to base of setæ. The eyes are gibbous and look as if a mass had been protruded laterally by pressure. The legs were imperfect; only one pair was elongated, as seen in the figure.

The base of the inner antennæ is about three times as long as the eyes. First joint nearly two-thirds the length of the whole; third joint a little longer than the second. Apex of first joint prolonged as far as apex of next segment; only a few short hairs on these basal joints. At apex of base two one-jointed branches, as long each as third joint of base; and also one or two long plumose processes on under side, which are three times as long as the branch.

## CYRTOPIA DETRUNCATA.

*Carapax breviter rostratus (rostro oculis valde brevior), marginibus integer, anticè posticeque angulis rotundatus. Segmentum abdominis posticum lamellis caudalibus parce longius, apice truncatum et spinulis minutis æquis armatum, barbâ apicem non superantibus.*

Carapax short rostrate (beak being much shorter than the eyes), margin entire and angles before and behind rounded. Last abdominal segment slightly longer than caudal lamellæ, truncate at apex and armed with minute equal spinules, subapical barb not extending beyond apex of segment.

Plate 43, fig. 3 *a*, animal, immature; *b*, eyes and inner antennæ; *c*, caudal extremity; *d*, outer antennæ; *e*, extremity of mandible; *f*, *g*, maxillæ; *h*, antepenult leg; *i*, penult leg; *k*, posterior pair; *l*, part of liver.

Pacific, off south end of Hopper Island, near the equator, in longitude 173° east. Collected, at 4 A. M., April 16, 1841.

Length, one-third of an inch. Colourless. Body slender. Carapax deeply excavate behind. Inner pair of antennæ with the base more than twice as long as the eyes; first joint longer than the two following together; the lower or outer apex of this joint prolonged nearly to apex of following joint; second and third joints (or two last of base) subequal.

The mandibles appeared to have no palpus (but this requires farther examination); they are dentated at apex, and have a stout molar process on one side. Maxillæ lamellar, as in figures *f*, *g*.

As the animal was immature, there were but three pairs of legs very distinct; the second and third had furcate branchiæ at base; besides these, there are two pairs of branchiæ posterior to the legs, they were small bi-digitate sacs, attached by a short pedicel of the same size. The second pair of legs was the longest, and both the second and third had a short branch or palpus, but not so developed as to be used as an



organ of motion. The legs terminate in a few setules, without a claw.

Segments of abdomen naked. Last segment narrowing a very little towards apex. The seta-like processes either side of extremity are close appressed to the segment, and do not project beyond the short apical spinules. Caudal lamellæ a little shorter than the segment, the outer not jointed. Base of the caudal appendages a little spinose on the margin; long hairs on inner side and end of outer, and on both margins of inner.

Liver many-lobed, somewhat botryoidal. Abdominal natatory appendages nearly as in the Euphausiæ.

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## FAMILY II. MYSIDÆ.

### SUBFAMILY I. MYSINÆ.

THE genera here included differ most obviously in the presence or absence of a scale at apex of base of inner antennæ; in the number of thoracic feet, some of the anterior sometimes acting as maxillipeds and differing from the following, in the character of the articulation of these legs; in the greater or less development of the abdominal appendages; in the caudal segment and lamellæ. The posterior thoracic legs are never wanting, as in the Euphausiæ, and when the number of pairs is but six, it arises from the pairs anterior being small and properly maxillipeds in character. In the genus *Mysis* the pediform branch of the thoracic legs has the tarsus indistinctly multiarticulate, a peculiarity not yet observed in other genera.

### GENUS PROMYSIS.

*Antennæ internæ flagellis duobus laminâque oblongâ confectæ. Oculi symmetrici, breves. Pedes thoracis duodecim et tarso simplice, unguiculato. Maxillipedes quatuor pediformes, paræ secundo et paribus pedum*

*totis palpo natatorio extus instructis. Pedes abdominis natatorii, sub-æqui. [Segmentum abdominis in specie scrutatâ posticum emarginatum vel bilobatum.]*

Near *Mysis*. First antennæ having two flagella and an oblong scale at apex of base. Eyes symmetrical, short. Thoracic feet twelve, tarsus not jointed, unguiculate; four pediform maxillipeds; second pair of maxillipeds and all the feet with a natatory palpus. Abdominal feet natatory, subequal. [Last segment of abdomen in the known species emarginate or bilobate behind.]

This genus is closely allied to *Mysis*, from which it differs in not having the tarsus many-jointed. The abdominal feet are all well developed and natatory. The first antennæ have an oblong lamella at apex of basal portion, as well as two long multiarticulate flagella; one of the flagella (the upper) commonly is slightly stouter at base, and hairy in this part on one side.

Seven pairs of pediform organs have similar natatory palpi: but the first of these pairs is shorter than the following, and is thrown forward with the extremity downward, while the others are flexed outward and forward; it is, therefore, properly a pair of maxillipeds. Anterior to these organs, there is another pair of maxillipeds slightly stouter than the second pair, and having a similar position.

The inner caudal lamellæ have a small, transparent, globular gland in the basal portion, like *Mysis*.

#### PROMYSIS ORIENTALIS.

*Carapax breviter rostratus, rostro oculis multo brevior. Antennæ interuæ apice basis valde crassæ, articulo tertio vix oblongo. Pedes thoracis gracillimi, breviter et sparsim ciliati, ungue oblongo, tenuissimo, palpo multo brevior quam ramus pediformis. Segmentum abdominis posticum supra longitudinaliter concavum, lamellis caudalibus valde brevius, basi latius et crassius, apice paulo furcatum et acutum, marginibus breviter spinulosis. Lamella caudalis externa internâ multo longior, extus intusque ciliata.*

Carapax short beaked, beak much shorter than the eyes. Interior an-



tennæ very stout at apex of base, the last joint of base being hardly oblong. Thoracic feet very slender, short and sparsely ciliate, claw oblong and very slender, palpus much shorter than pediform branch. Last abdominal segment longitudinally deeply concave above, nearly half shorter than outer caudal lamella, broadest at base, short furcate at apex and acute, sides short spinulous. Outer caudal lamella much longer than inner, ciliate on both margins.

Plate 43, fig. 4 *a*, animal, enlarged; *b*, caudal lamellæ, enlarged, the caudal segment removed; *c*, caudal segment, enlarged to correspond; *c'*, same, in oblique side view.

China Sea, four hundred and fifty miles from Singapore, to the northeast. Collected, February 16, 1842.

Length, two-fifths of an inch. A little reddish yellow along the venter. The carapax has a slight depression dorsally, not far from the front, as if indicating the separation of a cephalic portion; and another just back of beak. The beak is acute. The last abdominal segment is longitudinally deep concave, and ends in two acute points separated by a rounded emargination. The segment narrows from its base with a curve, the narrowing scarcely perceptible near apex. The last joint of base of first antennæ is very stout, nearly as broad as long. Penult joint of base of outer antennæ three times as long as last joint of base. Flagella of antennæ were mutilated; but enough remained to show that they were quite long and very slender. The upper of first pair is stouter and hairy at base.

The abdominal appendages all well developed, being of full length, and consisting of a base and two oblong ciliate lamellæ. The setæ were short.

#### GENUS MACROMYSIS, *White*.

*Carapax plus minusve rostratus. Antennæ internæ flagellis duobus laminâque oblongâ confectæ. Oculi symmetrici, breviusculi. Pedes thoracis sexdecim, toti palpo natatorio multiarticulato instructi, tarso simplice, unguiculato. Pedes abdominis plerumque parvuli, quarti valde elongati. [Segmentum abdominis posticum bilobatum vel emarginatum.]*

Carapax more or less rostrate. Inner antennæ having two flagella and an oblong scale at apex of base. Eyes symmetrical, rather short. Thoracic feet sixteen, all having a natatory palpus, which is multiarticulate, tarsus of pediform branch not jointed, unguiculate. Abdominal feet mostly small and imperfect, fourth pair very much elongate. [Last abdominal segment bilobate or emarginate behind.]

The elongate form of the fourth pair of abdominal legs may be only sexual and possibly occurs in other genera. The sixteen thoracic feet, and the imperfect character of the larger part of the abdominal feet distinguish this genus from *Promysis*. The inner caudal lamellæ have the transparent globule at base, characteristic of *Mysis*. The females have the usual pouch under the posterior part of the thorax.

*Themisto*, GOODSIR, Edinburgh New Phil. Jour., xxxiii. 176, pl. 2, f. 4; Goodsir's *T. brevispinosa* corresponds well with our species in general form; but his figure of the *T. longispinosa* is quite another thing in its legs, which to us are unintelligible.

*Macromysis*, A. WHITE, Cat. Crust. Brit. Mus., 1847, 81, and 1850, 45.

*Mysidium*, DANA, Am. J. Sci. [2], ix. 130, 1850.

#### MACROMYSIS GRACILIS.

*Carapax brevissimè rostratus, segmentum thoracis septimum non tegens, posticè quoad dorsum profundè excavatus et latere rotundatus. Basis antennarum internarum tenuis; flagella valde inæqua, superiore fere duplo longiore et dimidium corporis longitudine valde superante. Antennæ externæ fere corporis longitudine, squamâ basali lanceolatâ. Segmentum abdominis posticum apice obsolete rotundato-bilobatum et spinulis ciliatum, lamellâ caudali externâ plus dimidio brevius; hâc lamellâ extus spinulosâ, valde longiore quam interna.*

Carapax very short rostrate, not covering last thoracic segment, behind over the back profoundly excavate and laterally rounded. Base of inner antennæ slender, flagella very unequal, the superior nearly twice the longest, and much longer than half the body. Outer antennæ almost as long as the body, basal scale lanceolate. Last abdominal segment obsolete rounded bilobate at apex and



ciliated with spinules, more than half shorter than outer caudal lamella; this lamella spinulose on outer side, and much longer than inner lamellæ.

Plate 43, fig. 5 *a*, animal, enlarged; *b*, caudal extremity; *b'*, inner caudal lamellæ; *c*, base of interior antennæ; *d*, base of exterior antennæ; *e*, one of the thoracic legs; *f*, one of the scales of the ovarian pouch; *g*, *h*, *i*, *k*, *l*, *m*, young, in different successive states.

Harbour of Rio de Janeiro. Collected in vast numbers, December, 1838.

Length, four to six lines. A cephalic portion of the carapax is partly separated by a suture from the rest. Beak but slightly projecting. Segments of abdomen nearly as long as broad, sixth nearly twice its breadth in length. Outer caudal lamella quite long, one-third longer than inner lamella, truncate at extremity, and rather stout spinulose; inner lamellæ nearly twice as long as caudal segment. Caudal segment of nearly equal width throughout. Eyes with a large pedicel, stout and little oblong; facets very minute. Superior antennæ with second joint of base shortest, first longest. Upper flagellum about two-thirds the length of the whole body, lower about half as long as the upper. The upper is often thrown back, the two having the position in the figure. The oblong scale at apex of base of these antennæ is stout, obtuse, and close ciliate. Inferior antennæ full three-fourths as long as body. The basal scale extends half its length or more beyond apex of base, and gradually narrows to an obtuse point; it is long ciliate on both sides.

Eight pairs of thoracic legs of nearly equal length and similar structure; the anterior pair a little the smallest, and increasing from this to the seventh, eighth smaller than seventh. First joint of leg compressed, broad triangular, second joint (or first of pediform branch) very short, following three oblong, nearly equal, the last of the three most slender and longest, all setose within in two ranges; at extremity a distinct claw. Palpus much shorter than other branch, extending a little beyond the apex of its penult joint, first joint nearly round obovate, the rest of the organ slender and multiarticulate, consisting of ten short joints. Plates of ovarian pouch in females concave lunate, with the margin ciliate. The largest number of young seen at any one time in this pouch was six, and they were in all states of

maturity, from the undeveloped egg, to the young with jointed members. The different states observed are represented in figures *g* to *m*. On the 11th of December, these young were found abundantly, and nearly all the specimens obtained were females. On the 24th of the same month, no gravid females could be found, and at the same locality not more than six adults out of a hundred specimens. They were in general about half grown, being one-tenth of an inch long, instead of one-third, the usual adult size, and none had ovarian pouches. In adult males, the scales of the ovarian pouch are replaced by very short organs situated nearly between the bases of the preceding pairs.

Abdominal appendages of first three segments, short, and close appressed to the venter; of fourth segment, long and slender, consisting of a two-jointed basal portion, with which is articulated a slender extremity, having two small joints towards its extremity and terminating in two unequal setæ. This organ reaches back a little beyond the extremity of the body.

GENUS SIRIELLA, *Dana*.

*Carapax vix rostratus. Pedes thoracici numero sexdecim, toti biramei; palpo elongato basi valde lato flagelloque multiarticulato; ramo pediformi unguiculato, 5-articulato (ungue incluso). Oculi fere orbiculati. Antennæ internæ birameæ, externæ flagello confectæ laminâque oblongâ basali. Appendices abdominales rudimentariæ. Segmentum abdominis postremum apice rotundatum et spinulis ciliatum.*

Carapax hardly rostrate. Thoracic feet eight pairs, all two-branched, the palpus elongate, and consisting of a very broad basal joint and a multiarticulate extremity, the main branch unguiculate, five-jointed (claw included). Eyes nearly orbicular. Inner antennæ two-branched; outer ending in a flagellum and having an oblong scale at base. Abdominal appendages all rudimentary. Posterior segment of abdomen rounded at apex, and ciliate with minute spinules.

These species have a pouch for the young, under the posterior part of the thorax, like those of Mysis. Yet they differ, in having eight pairs of feet, and all unguiculate. The last abdominal segment is



alike, in the several species discovered, in being rounded behind and set around with spinules. Besides the claw terminating the thoracic legs, there is a number of short setæ, about as long as the claw, or somewhat exceeding it in length. The mandible has a rather small molar extremity, and bears a three-jointed palpus. The inner maxillæ are oblong lamellar; they bear a tuft of setæ at apex, and also a lateral branch, which is short and furnished with a few setæ. The outer maxillæ or maxillipeds consist of a short basal joint, hardly distinct; a broad lamellar joint, which narrows upward; and a third joint, which is oblong, and in one species appeared to be three-jointed. The second joint of the organ has two lobes or plates on its inner side, and just exterior to it, there is an oblong lamella, which proceeds from the first or basal joint of the organ. The eyes are large globular, with a short pedicel. One of the flagella of the first antennæ is stoutish and pubescent at base. The inner caudal lamella contains near base a small oval, transparent gland. The palpus of the thoracic legs has a very broad, oblique, round-obovate basal joint.

In two species, an oblong oval gland was observed in the thorax (see fig. 6, pl. 43, and fig. 1, pl. 44), which was very large in females, and probably, is ovarian in function.

#### SIRIELLA VITREA.

*Carapax fronte obsolete triangulatus, angulo infero-antico acutus sed non productus, infero-postico rotundatus. Oculi maximi orbiculati. Segmentum abdominis posticum spinulis æquè circumdatum, laminam caudalem externam fere æquans, internâ multo brevius. Antennarum basis externarum basi internarum valde brevior. Pedum rami thoracorum inæqui.*

Carapax very low triangular in front, acute but not prolonged at lower anterior angle, rounded behind. Eyes very large orbicular. Last abdominal segment set around evenly with spines, the segment about as long as outer caudal lamina and much shorter than the inner. Base of outer antennæ very much shorter than that of inner. Branches of thoracic feet unequal.

Plate 43, fig. 6 *a*, animal, enlarged; *b*, lateral view, more enlarged;

*c, c'*, mandible in different positions; *d*, first maxilla; *e*, second maxilla; *f*, lower lip; *g*, inner antennæ; *h*, outer antennæ; *i*, first feet; *k*, second feet; *l*, one of six posterior pairs; *m*, extremity of last pair.

Pacific; latitude 18° to 18° 30' south, longitude 124° to 136° west. Caught two individuals August 7th, 1839, and one August 13th.

Length, one-eighth of an inch. Colourless and transparent; one specimen purplish along the under side of abdomen and reddish along the sides of the thorax; eyes black, with some blue reflections; the pigment, probably blue-black. Eyes very large globular, the sphere rather shorter than broad, and standing on a short, slender peduncle. Facets in quadrate order. Inner antennæ with base oblong cylindrical, three-jointed, second joint very short, the others oblong, the first longer than third. [The length of the two flagella uncertain, as they were broken in the specimens seen.] Outer antennæ with a four-jointed base, which bears an oblong scale at apex of second joint; the scale has outer apex acute and is ciliated on the inner and apical margin; first two joints of base more than twice the diameter of the following two.

Mandibles moderately stout, having a few blunt teeth at apex. Palpus with the first joint very short, second oblong subovate, the more convex side minutely setulose; last joint rather slender and acuminate. A stout spine at the base of the mandible, but its exact position was not ascertained; the figures represent different positions after dissection. The maxillæ are narrow oblong, with a few somewhat divergent setæ at apex, a small short joint attached near middle of inner side. The outer pair of maxillipeds have the second joint subtriangular, narrowing above, longer than palpus alongside. The third joint is oblong and set on the apical and inner margin with short setæ. There are two lamellar lobes on inner side of second joint. Lower lip as in figure *f*.

Thoracic feet of two anterior pairs much shorter than posterior, and pediform branch not as long as palpus; also no cluster of setæ at apex of penult joint, adjoining the claw, as in the following pairs; this pediform branch of the two anterior pairs is not usually in sight in the ordinary motions of the animal, as they are thrown forward near the mouth. Penult joint (or that with which the claw is articulated) cylindrical in the six posterior pairs. The setæ at apex about as long



as the claw, and they may be separated at will, like fingers. Palpus of these legs has the basal joint nearly or quite as broad as long, narrowest below, and rounded at apex, excepting in first pair, in which it is subacute on the more prominent side. Posterior legs shorter than the five pairs preceding. At base of last pair in a female, a pair of large lunate, concave plates, as in *Mysis*, forming together a pouch, within which the immature young are confined.

Within the thorax, extending through three or four segments preceding the last, there is a pair of oblong glandular masses, of a deep blue colour, pearly by reflected light. They are very large, and occupy more than half the length of the thorax. The stomach was just anterior to these glands; it was membranous, and in folds above. The liver was situated above the stomach, as appeared through the shell.

First five segments of abdomen subequal, together about as long as the carapax; sixth segment as long as fourth and fifth; seventh segment a little shorter than sixth, narrowing a little to a rounded entire apex, which is furnished with a few short spines, and another series of still shorter spines. Caudal lamellæ longer than segment, the outer but slightly longer and furnished within with hairs as long as the lamella; the inner much longer but not ciliate, both rounded at apex.

These animals move with rapidity and very gracefully.

#### SIRIELLA GRACILIS.

*Carapax fronte paulo triangulatus. Segmentum abdominis posticum spinulis circumdatum, spinulis duabus longioribus, laminâ caudali externâ paulo brevius et internâ multo brevius. Oculi mediocres. Flagella antennarum internarum valde inæqua, majore longitudine thoracem superante; externarum flagellum dimidio corporis longius. Pedum rami thoracicorum inæqui.*

Carapax low triangulate in front. Last abdominal segment edged with spinules, two spinules longer than the rest, length, a little less than that of outer caudal lamina, much less than that of the inner. Eyes rather small. Flagella of inner antennæ very unequal, the larger longer than thorax. Flagellum of outer antennæ two-thirds as long as the body. Branches of feet unequal.

Plate 44, fig. 1 *a*, male, enlarged; *b*, posterior part of thorax of female, more enlarged; *c*, extremity of abdomen; *d*, first maxilla; *e*, maxilliped; *f*, first pair of legs; *f'*, fouette, attached at base; *g*, one of posterior legs.

Pacific, near St. Augustine's Island; also, near Pitt's Island, Kingsmills Group. Collected, March 25, 1841, and April 30, 1841; also, latitude 15° north, longitude 180° west, December 9, 1841.

Length, two and a half lines. Colourless. The last abdominal segment is but little shorter than caudal lamella adjoining, and the eyes are much smaller than in the *vitrea*. The outer caudal lamella is hardly shorter than the inner. The hairs extend back some distance on outer side, and rapidly diminish in length, the last being the shortest and quite minute; hairs at extremity are nearly half the length of the lamella. The inner lamella has a stout, longish spine at apex, besides hairs on the margins. Diameter of eyes scarcely more than half the breadth of the abdomen at its base. Basal scale of outer antennæ reaches a little beyond apex of base, and the base extends half its length beyond the eyes. Hairs on under side of flagellum few and not longer than diameter of joints. Shorter flagellum of first antennæ have on basal half two distant minute spines.

An ensiform lamella (fouette, fig. *f*) attached to base of first pair of legs and kept in constant vibration under the carapax. Reniform gland in thorax small in male (see figure), but very large oblong in female; it was nearly as long as thorax and two-thirds as broad.

A specimen of *Siriella* collected in the Sooloo Sea (Plate 42, fig. 2 *a*, *b*, *c*), has the general characters of the *gracilis*, the eyes (fig. *a*) a little larger, the caudal lamellæ (fig. *b*) equal, and the caudal segment as in the *gracilis*, the hairs of the lamellæ quite long, and extending up on outer side of outer lamella some distance from extremity, with the last of the hairs short like spinules, and the very last one the shortest of all; the front prominent triangular; the basal scale of outer antennæ extending as far forward as the base of inner antennæ. The specimen is a male, and has a prominent tooth or spine on the lower side of the sixth abdominal segment (fig. *c*), a character not observed by us in the male of the *gracilis*.



## SIRIELLA BREVIPES.

*Carapax fronte prominulè triangulatus. Segmentum abdominis posticum spinulis æque circumdatum; lamellæ caudales paululo inæquales, segmento caudali longiores, ambæ longè ciliatæ. Oculi pergrandes. Pedum ramî thoracicorum fere æqui. Flagellum antennæ secundæ thorace paulo longius.*

Carapax low triangular in front. Last abdominal segment evenly margined with spinules. Caudal lamellæ but little unequal, longer than caudal segment, both long ciliate. Eyes quite large. Branches of thoracic feet nearly equal. Flagellum of second antennæ rather longer than thorax.

Plate 44, fig. 3 *a*, animal, enlarged; *b*, extremity of abdomen.

Pacific, south of the Kingsmills, near Sherson's Island, March 24, 1841.

Length, one-tenth of an inch. Colour, slightly reddish or flesh-red. Body, nearly cylindrical. Last two abdominal segments of nearly equal length. Hairs of caudal lamellæ shorter than the lamella. Eyes nearly as large in diameter as the abdomen at base, on short pedicels. [Antennæ were broken in the specimen examined, excepting the outer or second pair.] Joints of flagellum of second pair of antennæ oblong, a short hair or two on each. Only the short apical joint of the base of these antennæ extends beyond the eyes; this last character and the much larger eyes, nearly equal branches to legs as well as abdomen, distinguish this species from the *gracilis*; and the same characters, excepting the size of the eyes, remove it from the *vitrea*. The legs are shorter than usual. The infero-anterior angle of the carapax is hardly acute.

## GENUS LOXOPIS.

*Carapax rostratus. Oculi elongato-ovati, lateraliter spectantes, lenticulis totis externi-lateralibus parce obliquis. Antennæ externæ squamâ*

*basali instructæ; internæ bifidæ. Pedes sex prominentes, duo postici obsoleti (?). Appendices abdominis rudimentarii. Segmentum abdominis posticum angustum, apice truncatum vel obtusum et spinulis armatum.*

Carapax rostrate. Eyes elongate-oval, looking laterally, the lenses all lateral, being directed outward or sparingly oblique. Second antennæ having a scale from the base; first pair bifid. Six prominent pairs of feet, the two posterior obsolete (?). Abdominal appendages rudimentary. Last abdominal segment narrow, truncate or obtuse at apex and armed with spinules.

The eyes have an oblique arrangement on the pedicel, as in *Cyrtopia*, but here the facets are more lateral, covering a large part of the lateral surface, and the pigment is oblong. The abdominal legs may be immature, and so also, the thoracic; yet we doubt somewhat on this point, since the specimen was nearly half an inch in length.

#### LOXOPIS TRIDENS.

*Carapax acutè rostratus (rostro oculis valde breviorè) juxta rostrum spinâ utrinque armatus, ad medium dorsum regionis gastrici dente triangulato instructus. Oculi oblongi, obliquè ovati. Segmentum abdominis posticum basi parce latius, apice truncatum et spinulis ciliatum, spinulis duâbus externis plus duplo longioribus. Lamellæ caudales segmento caudali vix breviores. Pedes mediocres; palpo cylindrico uni-articulato, setis brevibus paucis apicalibus; ramo altero etiam uni-articulato (an pedes maturi?) non longiore.*

Carapax with an acute beak much shorter than the eyes, and having a spiniform tooth either side, also a triangular tooth on the back of gastric region. Eyes oblong, obliquely ovate. Last segment of abdomen a little broader at base, truncate at apex, and ciliate with spinules, the two outer spinules more than twice as long as the others. Caudal lamellæ hardly shorter than caudal segment. Feet of moderate size, palpus oblong cylindrical, one-jointed, having a few short setæ at apex; other branch also one-jointed (feet perhaps not mature), and not longer than the palpus.



Plate 44, fig. 4 *a*, animal enlarged; *b*, head, upper view; *c*, caudal extremity.

Sooloo Archipelago. Collected, February 2, 1842.

Length, five lines. Colourless. There appears to be a small pair of legs near the mouth, then six pairs subequal, the first and last a little smaller than the others, then a mere tubercle or process corresponding to a posterior pair. The branches are not jointed, and this is the only reason for thinking the animal immature; the large size of the individual, five lines, seems to show that it is mature, unless it may prove to be young of some Macroural Crustacean. The palpus of the two posterior pairs was a little longer than the other branch, but of the other pairs about the same in length as this branch. The beak is about half as long as the eyes. The abdominal appendages are all imperfect. The last segment has a longish spinule at either angle of apex, and several quite short and equal between these. The caudal lamellæ are about as long as the caudal segment, and are furnished with setæ. The outer is not jointed.

The antennæ were mutilated. The inner pair was provided with two short setaceous branches.

#### SUBFAMILY II. SCELETININÆ.

The only species of this group observed have the front of the carapax deeply tridentate, the middle acute process being a long beak.

#### GENUS SCELETINA, Dana.

*Carapax ovatus, anticè transversim constrictus instar colli, et fronte tricuspidatus. Abdomen tenuissimum. Oculi longi, obconici. Segmentum abdominis posticum truncatum et spinulis inæquis armatum. Pedes thoracici elongati duodecim, biramei, ramo pediformi 4-5-articulato, altero (palpo) setis paucis instructo. Pedes alii quatuor antici parvuli. Appendices abdominis rudimentarii.*

Carapax ovate, with a constriction across anteriorly like a neck, tri-

cuspidate in front. Eyes long, obconical. Abdomen very slender. Posterior segment truncate and armed with minute unequal spinules. Thoracic feet twelve, two-branched, pediform branch four or five-jointed, the other (or palpus) furnished with a few setæ; other four feet anterior to these quite small. Abdominal appendages rudimentary.

This species, as it swims, with its very slender body, its extended legs, and thorax of peculiar form, has much the aspect of a skeleton, the legs corresponding to the ribs. The front is acute and rather long rostrate; and either side there is a divaricate acute projection, shorter than the beak. The neck is quite narrow in some species, being less than half the greatest breadth of the thorax; and sometimes there is a stout spine on what may be called the shoulders. The penult abdominal segment has a spine at apex, and the last segment is nearly linear, with a truncate or excavate apex, and a regular arrangement of spinules, one at either angle larger than the intermediate. The caudal lamellæ are very slender and short ciliate. The eyes are rather long conical, with the summit rounded. The abdomen is extremely slender, the joints all oblong. The appendages are short and naked.

The inner antennæ appear to be simple, few-jointed, but rather long. The outer have a short base and two flagella. No basal scale was observed. The joints of the flagella were quite long.

The posterior pair of thoracic legs is the smallest. The preceding five pairs are similar, and the last of them rather the longest.

#### SCELETINA ARMATA.

*Carapax anticè valde constrictus, cuspidibus lateralibus valde divaricatis collo angusto et humeris spinâ crassâ armatis. Segmenta abdominis 5 antica spinâ acutâ infra utrinque armata, ultimo lineari, truncato. Antennæ internæ thorace paululo breviores, 5-articulatæ, cylindricæ, articulo ultimo longiore.*

Carapax with the neck-like constriction deep, making the neck narrow, acute angles in front strongly divaricate, and shoulders back of constriction armed with a stout spine. Five anterior abdominal



segments armed laterally or below with an acute spine, last segment linear, truncate at apex. First antennæ a little shorter than thorax, five-jointed, cylindrical, last joint longest.

Plate 44, fig. 5; animal, enlarged.

Atlantic, latitude  $0^{\circ} 30'$  south, longitude  $17^{\circ} 30'$  west. Caught one individual, November 3, 1838.

Length, one-seventh of an inch. Colourless. At the front angles the carapax is very much broader than at the constriction; behind the constriction it widens and bears a spine either side, then gradually narrows, and at its posterior extremity is not wider than the slender abdomen. The beak is rather longer than the eyes. The sixth and seventh abdominal segments are about equal in length. Outer caudal lamella not jointed. Inner antennæ simple, cylindrical, only five joints observed, the second and last longest. A few rather long hairs on inner margin. The outer pair has two cylindrical branches or flagella on a short base, of which only one joint was distinguished. The branches were broken at their extremities; the part remaining consisted of long joints, and not of short ones like the flagella of other genera; first joint of the two branches of about the same length, second of inner branch about half the first joint.

Posterior legs considerably the shortest. The palpus is cylindrical, few-jointed, and not multiarticulate at extremity. The abdominal legs are small and naked.

#### SCELETINA LATICEPS.

*Carapax longè rostratus, latissimus, parce constrictus, cuspidibus lateralibus paululo divaricatis, collo latissimo, humeris non armatis. Abdomen tenuissimum; segmento postremo lineari, apice emarginato, lateribus medio spinulam minutam ferentibus. Antennæ internæ tenues, articulo primo oculis duplo longiore. Pedes postici precedentiibus dimidio fere breviores, palpo 2-articulato.*

Carapax long rostrate, very broad anteriorly, sparingly constricted, neck therefore very broad, and anterior angles of carapax but little

divergent, shoulders not armed. Abdomen very slender; caudal segment linear, emarginate at apex, and having a minute spine near middle of sides. First antennæ slender, first joint twice longer than the eyes. Posterior feet nearly half shorter than next preceding, palpus two-jointed.

Plate 44, fig. 6, animal, enlarged.

Pacific, thirty miles west of Assumption Island, one of the Ladrões. Collected, December 30, 1841.

Length, one-eighth of an inch. Colourless. The carapax is very much broader than in the *armata*, and but little contracted anteriorly, and, moreover, the front angles are slightly divergent; length of carapax, not twice its greatest breadth. The emargination at apex of last abdominal segment is rounded; each side of the same segment has a minute spine near middle, and quite near the apex there is a second lateral spinule; at apex there appeared to be six spinules. The branches of the thoracic legs are few-jointed;—only two or three joints are given in the drawing made from the living animal, and they are furnished with a few setæ. The outer antennæ of the specimen were broken.

#### SCELETINA ORIENTALIS.

*Carapax anticè constrictus, perangustus, cuspidibus lateralibus parce divaricatis, humeris armatis. Segmenta abdominis sex processu acuto infra utrinque armatum; 6tum longum, infra unispinosum; septimum fere lineare, apice truncato et spinulis sex armato, lateribus cum duabus spinulis minutis armatis. Pedum palpus apice minutè articulatus.*

Carapax constricted and very narrow in front, anterior acute angles a little divaricate, shoulders armed. Six abdominal segments provided below on either side with an acute process or spiniform tooth; sixth long and with a tooth below; last segment nearly linear, apex truncate and set with six spinules, each lateral margin with two spinules. Palpus of feet having minute joints at apex.



Plate 44, fig. 7 *a*, animal, enlarged; *b*, dorsal view of thorax; *c*, caudal extremity; *d*, palpus of legs.

Sooloo Sea, southwest of Panay. Collected, January 29, 1842.

Length, one-fourth of an inch. Colourless.

This species has smaller eyes and beak, and narrower front, with less divergent angles than the *armata*. The breadth of the front of the carapax is about half its greatest breadth. The beak is very slender, but does not project beyond the eyes when they are extended forward.

#### GENUS RACHITIA.

*Carapax rostratus. Oculi oblongi, obconici. Antennæ internæ non bifidæ, flagello tenui confectæ. Antennæ secundæ bifidæ, laminâ basali non instructæ. Segmentum abdominis sextum valde elongatum, septimum postice valde latius et bilobatum, rotundatum et setulis longiusculis inæquis instructum.*

Carapax rostrate. Eyes oblong, obconical. Inner antennæ not bifid, ending in a slender flagellum. Outer pair bifid, and without a basal scale. Sixth abdominal segment much elongate; last much broader behind and bilobate, lobes rounded, and set with longish, unequal setæ.

The animal upon which this genus is founded is not mature, and we cannot feel certain that it is not the young of some Decapod, possibly one of the subfamily Oplophorinæ, family Palæmonidæ. Yet, it so nearly approaches a *Sceletina* in its trident front, its obconical eyes, and its antennæ, both first and second pairs, that we are inclined to refer it to the same family with that genus. Moreover, it seems improbable that the caudal segment of *Rachitia* could belong to any of the Palæmonidæ. The abdomen of the only species known has along the back a long spine to each segment, except the two last, and the sixth segment is as long as the four preceding. The caudal extremity is evidently immature; the caudal lamellæ are quite small. The thoracic legs are only partly developed. Only three pairs were jointed, these were bifid, and the outer branch corresponding to the palpus was multiarticulate. The abdominal legs were altogether wanting.

## RACHITIA SPINALIS.

*Carapax antice acutè et longe tricuspidatus, spinâ mediâ (vel rostro) longiore (oculis duplo longiore), lateralibus ascendentibus, posticè angustus, transversus, marginibus lateralibus integris. Segmenta abdominalis quinque spinâ longâ acutâ dorso armata; segmentum sextum segmentis quatuor precedentibus simul suntis fere longius.*

Carapax long and acute tricuspidate in front, middle spine (or beak) longest (twice as long as the eyes), lateral flexed upward; posteriorly narrow and margin transverse, lateral margins entire. Five abdominal segments having a long acute spine on the back, sixth segment hardly shorter than the four preceding together.

Plate 44, fig. 8 *a, b*, different views of animal, enlarged; *c*, caudal extremity.

Atlantic, off the harbour of Rio de Janeiro. Collected, January 7, 1838.

Length, one-eighth of an inch. Colourless. The beak is straight and horizontal, while the spines either side are bent upward, as seen in a lateral view. The carapax, in a vertical view, is widest just anterior to middle, then narrows regularly till it becomes as narrow as abdomen at its posterior part. The first five abdominal segments are not oblong, and the dorsal spine is rather longer than the segment; the spine is directed backward and upward. These five segments are about as long as carapax, the last slightly longer than preceding. The sixth segment is nearly as long as preceding five. In the movements of the animal, the body is often flexed at the articulation preceding this segment. There is a spine on the under side of fifth segment, near the articulation with the sixth segment. The last segment of the body is somewhat triangular, narrowest at base, and terminates in two rounded lobes, each of which is nearly as broad as the segment at base; the sinus between the lobes is rounded. Three or four setæ at the extremity of each lobe are as long as the segment; besides these there are two or three shorter on inner side, and one on outer margin of lobe.



The inner antennæ consist of a long cylindrical, three-jointed, basal portion, a little longer than the beak of the carapax; the first two joints nearly equal, the third short and smaller. Flagellum very slender, whole length more than one-half the length of the body.

Three pairs of legs developed; all two-branched, branches unequal, the outer consisting of five joints, with a pencil of hairs at the extremity; the second of the three pairs largest. Posterior to these three pairs there were tubercles or rudiments of four more pairs.

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### FAMILY III. LUCIFERIDÆ.

#### GENUS LUCIFER, *Thompson.*

*Corpus valde attenuatum, segmento antennali elongato, tenui. Antennæ totæ flagellis longis confectæ; externæ squamâ basali instructæ. Pedes thoracis numero decim, longi, non bifidi, duo antici valde replicati, 8 sequentes prorsum parce flexi; alii quatuor posteriores normales obsoleti. Pedes abdominis bene natatorii.*

Body very much attenuated, antennary segment elongate, slender. The four antennæ with long flagella, outer pair with a basal scale. Thoracic feet ten in number, not two-branched, the two anterior each folded back upon itself, the eight following thrown forward; posterior to these, two normal pairs are obsolete. Abdominal feet large and natatory.

The long antennary segment is like a slender neck, and is usually separated from the proper carapax by a suture, more or less distinct. It is without a beak, or has but a short one, and has a spine in front on either side. It bears two pairs of antennæ and long eyes, as above described. The first basal joint of the inner antennæ is not shorter than the eyes; the next two joints are quite short. The base of the outer antennæ is very much shorter than that of the inner. The flagella of both pairs are slender, and consist of long joints. The

small spheroidal organ in the bases of the inner antennæ, shown to correspond to ears, by Huxley, are very distinct.

The carapax following the antennary segment is very small and narrow, and hardly covers the bases of the legs. In a vertical view, it is widest in front, the form being narrow ovate, and on each shoulder there is an acute spine; posteriorly it narrows, so as not to be wider than the abdomen where it meets it, and in this respect the genus is like *Sceletina*. In a lateral view, the portion of the cephalothorax covered by the carapax is widest posteriorly. At its anterior part there is a buccal prominence, containing a pair of mandibles, and followed by two pairs of maxillæ and one of maxillipeds. The mandibles are without palpi, and have a dentate summit. The maxillæ are represented on Plate 44, figures 9 *e*, 9 *f*. The following organs are five pairs of thoracic legs, the first pair of which might as properly be called maxillipeds, as they are folded back, at the third articulation, upon themselves, and thus differ from the true legs, which are all nearly straight, and project forward when in their natural position. These legs consist of five to six joints, and have two divergent series of shortish setæ ranging along their length; they are without a palpus, or it is obsolescent. The first pair has a fouette, which extends back under the carapax, and is kept in constant rapid motion, and has distinctly six joints; the following three pairs appear to have but five joints, the claw or tarsus being absent; the last pair has a very short claw. The last two pairs are the longest, next the second, and next the third pair, this being much shorter than either of those adjoining.

Counting the cephalothoracic organs that are present in these animals, we find only twelve pairs, as follows:—

1. The eyes.
- 2, 3. The antennæ, two pairs.
4. The mandibles.
- 5, 6. The maxillæ, two pairs.
7. The outer maxillipeds.
- 8, 9, 10, 11, 12. Five pairs of legs.

It appears, therefore, that there are normally two pairs obsolete, no trace of which, either through a tubercle, or any other sign, is present. There is, however, in the posterior part of the thorax in males a glassy, reddish-coloured organ, of an eardrop form, as shown in



figure 9 *b*, at *m*, Plate 44. It may be made to extrude by a little pressure, when it appears as in fig. *h*, at *m'*, the extremity being very glassy and rounded, while above it becomes very slender. It proceeds from or lies in a glandular mass, which curves backward into the first abdominal segment, where it meets another glassy organ, globular anteriorly, but is lost posteriorly in a soft glandular mass; it extends backward towards the first pair of abdominal legs. After being removed from the animal for a short time, the anterior of these glassy organs loses its colour, and the fluids within contract somewhat from the interior walls, as shown in figure *m''*. The uses of this organ we have not made out. We have not found it in females. It is seen a little projecting in Thompson's figure of a Lucifer, and it is this prominence which Edwards has supposed to be a rudiment of a leg of a posterior obsolescent pair.

The abdomen consists of seven oblong segments. The sixth is often much longer than the fifth, and in males, at least, has frequently one or two teeth, or processes, either acute or obtuse on its inferior side. The caudal segment is usually shorter than the caudal lamellæ, and often, instead of being straight below, in *males* it has a rounded protuberance; it is furnished with two setules on the inner margin, and has at apex (which is truncate) some shorter setules, with those at the angles usually the longest. There are five pairs of abdominal appendages besides the caudal pair; they have a long base and two narrow multiarticulate ciliate branches, somewhat shorter than the basal portion. The first of these pairs has a protuberance on the anterior margin of the basal portion, which is rudely triangular in outline; it has an articulation, so that it is fitted for prehension; and its extremity shuts upon a small spine situated on the surface of the leg. The second pair has an oblong, narrow, subfalciform appendage at the apex of its basal portion, in addition to the two branches. The remaining three pairs have the usual form, except that the parts are very narrow; the branches are about ten-jointed. In females, all the five pairs are alike in form and structure.

The alimentary cavity is prolonged forward in the antennary segment, nearly to its extremity, in the form of a slender tube, like the intestine. Glands, consisting of short cylindrical sacs, are clustered along near the intestine, in the posterior half of the cephalothorax, which may be the liver; yet, as we could detect them only in females,

it is more probable that they are ovarian. The particles of the blood are distinct.

*Lucifer*, THOMPSON, Zoological Researches, Cork, April, 1829, Part ii. p. 58; EDWARDS, Crust., ii. 467.

## LUCIFER ACESTRA.

*Segmentum antennale non rostratum, carapace multo longius. Oculi prælongi, segmenti antennalis dimidio bene longiores, pedunculo tenuiter cylindrico et globo apicali grandi instructi. Segmentum abdominis sextum 5to fere duplo longius, maris dentibus duobus infra armatum, dente antico acuto, postico obtuso et recurvato. Segmentum caudale laminâ caudali internâ duplo brevius, maris, infra gibbosum, gibbosulâ latâ, non obliquè inclinatâ.*

Antennary segment much longer than carapax. Eyes very long, much exceeding half of antennary segment, having a slender cylindrical peduncle and a large globular summit. Sixth segment of abdomen about twice as long as fifth, in *males* having an acute tooth below near middle, and posteriorly an obtuse process which is recurved. Caudal segment one-third as long as outer caudal lamina, and half as long as the inner, below gibbous in males, the prominence broad and not obliquely inclined.

Plate 44, fig. 9 *a*, male, enlarged; *b*, anterior half, more enlarged; *c*, side view of caudal extremity in a male; *c'*, caudal segment, upper view; *d*, mandible; *e*, *f*, first and second maxillæ; *g*, outer maxillipeds; *h*, posterior extremity of thorax, showing glassy eardrop organ at *m'*; *m''*, same organ, as it appeared after a short time detached from the animal; *i*, outline of posterior part of thorax of female.

Pacific Ocean, latitude 6° 30' south, longitude 177° east, near Sher-son's Island. Caught twenty individuals, with twenty-four casts of a hand net, at 7 A. M., March 24, 1841.

Length, five-eighths of an inch. Colourless, excepting a little red-



dish purple along the venter and in the eardrop organ, and also the connected glassy organ in first abdominal segment. Length of antennary segment more than eight times its breadth. Inner caudal lamella a fourth shorter than outer lamella; outer, acute at apex, naked on outer margin, ciliate within.

Base of inner antennæ about as long as antennary segment; flagellum half as long as animal, very slender. Scale of outer antennæ slender, a little longer than base of same; flagellum longer than half the animal.

In females found with this species, and believed to be identical with it, the sixth abdominal segment was entire below, without the two teeth above described.

This species has the long antennary segment of the *Reynaudi*; but the eyes are much longer, being in this respect nearer Thompson's species, from which, however, it differs in the relative lengths of its caudal segment and appendages.

#### LUCIFER REYNAUDI, *Edwards*.

Plate 45, fig. 1 *a*, female, enlarged; *b*, profile of extremity of abdomen of same; *c*, *ibid.* of male; *d*, profile of cephalothorax of male.

Sooloo Sea, Straits of Banca, East Indies.

Length, five lines. The eyes in this species (as represented by Milne Edwards) are not longer than half the length of the antennary segment. This segment is long and slender, being full half longer than the carapax. There is a spine either side at the base of each abdominal pair of legs, but it is not seen in a lateral view. The carapax has a spine on either shoulder, as in other species.

In *males*, the sixth abdominal segment has two prominent teeth or spines below; the anterior is acute; the posterior is always the longer, and is either acute or obtuse, usually the latter. Besides these, there are two minute setules just posterior to the hinder spine. The last or caudal segment is but little more than half the length of the sixth segment, and about two-thirds the length of the outer caudal lamellæ; on its under surface there is a rounded tubercle, which is isolated and prominent, and inclines somewhat backward. Moreover, the males

have the first and second pairs of abdominal legs, as explained in our remarks on the genus.

In *females*, the sixth abdominal segment is entire below, without teeth or spines, and with only the setules observed in the males. The caudal segment is thin, without any protuberance or gibbosity below.

In *one male, about half grown*, the anterior tooth of the sixth segment of the abdomen was obsolete, and the posterior spine was quite short, although of the same general character as to its extremity as in the full-grown males. This intermediate character in an immature male seems to confirm our inference, drawn from the general identity of character and their frequent association, that the animals described as such are actually male and female.

#### LUCIFER PACIFICUS.

*Segmentum antennale carapace paululo longius, utrinque anticè acutum, oculis paulo longius. Segmentum abdominis sextum duobus precedentibus simul sumtis parce longius et lamellâ caudali externâ paululo longius, infra integrum. Segmentum caudale dimidio precedentis brevius, et dimidio lamellæ externæ paulo longius.*

Antennary segment slightly longer than thoracic, acute anteriorly on each side. Anterior angles of thoracic segment bearing an acute spine. Sixth abdominal segment a little longer than two preceding together, and somewhat longer than the outer caudal lamella. Last segment half shorter than preceding, and a little more than half the length of the outer lamella.

Plate 45, fig. 2, animal, enlarged.

Pacific, latitude 15° 20' south, longitude 148° west. Collected at 4 A. M., September 10, 1839.

Length, three-tenths of an inch. Colourless. This species is near the *Reynaudii*, but has not so long and slender a cephalic segment. The eyes are clavate and somewhat longer than the part of the cephalothorax, posterior to the antennary segment. The third of the five pairs of legs, as usual, is much shorter than the second, fourth, or fifth



pair, which are nearly equal. The second joint of the last pair is much shorter than the thoracic segment. The basal scale of the exterior antennæ is longer than the eyes, and of the same length as the first joint of base of the first antennæ. The second joint of the base of these antennæ is quite short, not one-fourth the preceding.

The organs of the mouth observed were the same in number as already stated. None of the legs were furnished with palpi, or even rudiments of them, as far as observed; but the first or second pair had a fouette, which was extended back under the carapax, and was kept in constant motion.

Thompson's figure of his species (Pl. 7, fig. 2, Zool. Res.) represents a female, judging from the abdominal appendages; and yet the sixth abdominal segment has two prominent teeth below. In this respect it differs from the species here described.

#### LUCIFER ACICULARIS.

*Segmentum antennale carapace brevius, acutè rostratum et utrinque acutum. Oculi clavati, segmento antennali paululo breviores. Segmentum abdominis sextum valde elongatum lamellis caudalibus valde longius, feminae infra integrum, segmentum caudale lamellæque totæ longitudine vere æquæ.*

Antennary segment shorter than carapax, acutely beaked and acute on either side. Eyes clavate, a little shorter than cephalic segment. Sixth abdominal segment much elongate, considerably longer than caudal lamellæ, entire below in female; caudal segment and lamellæ of nearly equal length.

Plate 45, fig. 3 *a*, animal, enlarged; *b*, side view of extremity of abdomen; *c*, dorsal view; *d*, base of posterior legs, with rudiment of a palpus.

Harbour of Rio Janeiro. Collected one specimen, December 25, 1838.

Length one-eighth of an inch. Colourless or whitish. Thoracic segment, in dorsal view, three times as wide anteriorly as antennary

segment, and the two separated by a suture. Abdomen extremely slender; first five segments subequal, sixth much longer, and constricted laterally just anterior to middle. Caudal segment truncate at apex; four apical spinules observed, and four lateral, the anterior of the lateral about one-third the distance from the base to the apex. Caudal lamellæ subequal, and scarcely longer than caudal segment; the outer having a spine at the outer apex, the inner obtuse, both slender. In a lateral view (fig. 3 *b*), the sixth abdominal segment is seen to have two short spines below near the extremity, and one at the superior apex.

The eyes give green internal reflections. Antennæ in the specimen possibly mutilated; first pair consists of four slender joints, first longer than the eyes, the second and third about equal, and each more than one-fourth the first, the last nearly as long as the first. This last joint may correspond to the flagellum, which, as the individual was quite small, might not have been wholly developed. The outer antennæ have a flagellum; the basal scale is slender oblong, longer than the eyes. The posterior legs have a rudimentary palpus at base (fig. *d*).

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#### APPENDIX TO THE MYSIDEA.

##### GENUS FURCILIA.

*Carapax aut breviter rostratus aut fronte truncatus. Oculi breves, symmetrici, aperti. Antennæ internæ bifidæ, basi elongato, articulo primo longo et ad apicem inferiorem longè producto, processu intus subtilissimè spinuloso. Antennæ externæ laminâ basali carentes. Abdominis pedes natatorii; segmentum posticum truncatum apice barbibus non ornatum, spinulis sæpius armatum. Branchiæ nullæ.*

Carapax either short beaked, or truncate in front. Eyes short, sym-



metrical, uncovered by the carapax. Anterior antennæ bifid, base long, and first joint with lower apex much prolonged and the process minutely spinulose within. Second antennæ without a scale at base. Abdominal feet natatory. Last segment of abdomen truncate, without a barb either side of extremity, but set with minute spinules. [Possibly young of some species of Eubranchiata or Decapoda.]

The Furciliæ collected by the author were none of them apparently mature. The thoracic members were but partly developed, and the abdominal in many instances were rudimentary. Yet as we know not where to refer them, they are for the present arranged here. They are alike in the inner antennæ, the base being long, and the lower apex of the first joint prolonged, with an acute process as long as the next joint. In this character, they resemble only the *Cyrtopiæ* among the species described, but unlike them the eyes are symmetrical, and the extremity of the abdomen has not the barb either side which characterizes the *Cyrtopiæ*, *Euphausiæ*, and allied species. The two branches of the inner antennæ, as far as observed, consist each of only one or two joints, often not longer than the apical joint of base; and to this simple furcation of the summit the name of the genus alludes. The spinules upon the truncate apical margin of the last abdominal segment are longer at the angles, and of even length along the middle. The exterior antennæ have also a bifid extremity, the branches being one or two-jointed in the species examined. The thoracic and abdominal appendages are without branchiæ. The latter, when fully developed, have the usual natatory form.

The species were mostly found in the open ocean.

#### FURCILIA MACROPHALMA.

*Carapax acutè rostratus, posticè excavatus et ad angulos rotundatus rostro oculis fere longiore. Oculi permagni, orbiculati, thorace parce angustiores. Basis antennarum internarum praelongus, carapace vix brevior; processus articuli primi articulo proximo brevior. Segmentum abdominis posticum lamellis caudalibus dimidio fere brevius, truncatum, nudum.*

Carapax acutely rostrate, behind dorsally excavate and angles rounded, beak rather longer than the eyes. Eyes very large, orbicular, but little narrower than thorax. Base of inner antennæ very long, hardly shorter than carapax, process of first joint shorter than the joint following. Last segment of abdomen nearly half shorter than caudal lamellæ, truncate, naked.

Plate 45, fig. 4 *a*, animal, enlarged; *b*, caudal extremity.

Pacific, among the Kingsmills Group, near Charlotte's Island. Collected, April 21, 1841.

Length, between two and three lines. Colourless. First joint of base of first antennæ half whole length of base, and extends about half its length beyond the eyes. Next two joints equal, oblong, a few short hairs at apex of each. Two branches at apex, rather shorter than preceding joint.

Legs of thorax were not full grown; abdominal appendages perfect, natatory, setæ short. A minute, clear globule in a projection at base of five pairs of abdominal legs. The caudal lamellæ in the specimen appeared to be full grown; they were about equal, and nearly twice as long as caudal segment; they were furnished with setæ, as usual, and there was no spine at apex of inner lamellæ. The caudal segment had *no spinules* at apex.

#### FURCILIA ABBREVIATA.

*Carapax acutè rostratus, posticè super dorsum parce excavatus angulisque rotundatus, rostro oculis brevior. Oculi mediocres. Basis antennarum internarum brevis; processus articuli primi articulo proximo longior. Segmentum abdominis postremum elongatum, truncatum, apice spinulosum, spinulis externis longioribus ad angulos contiguè infixis.*

Carapax acutely rostrate, beak shorter than the eyes, posteriorly over back sparingly excavate, at angles rounded. Eyes rather small. Base of inner antennæ short, process of first joint longer than joint



following. Last abdominal segment elongate, truncate, spinulous at apex, outer longer spinules situated close together on the angles.

Plate 45, fig. 5 *a*, animal, enlarged; *b*, caudal extremity.

Pacific, Kingsmills Islands, twenty miles north of Charlottes. Collected, April 21, 1841.

Length, one and a half lines. Colourless.

The individual examined was immature, the thoracic legs being all rudimentary, and not even tubercles apparent as representatives of the abdominal appendages, excepting for the two anterior pairs. The first antennæ were very much shorter than the carapax. The first joint extends a little beyond the eyes; and the process at its apex is one and a half times as long as following joint. The caudal lamellæ are also immature, being but half as long as the caudal segment. This segment has the usual length, and is probably quite as long as the lamellæ when they are mature.

#### FURCILIA MICROPHTHALMA.

*Carapax breviter rostratus, posticè transversus, angulis rotundatus, rostro oculis paulo longiore. Oculi parvuli. Antennæ internæ carapace paulo breviores, basi longo, processu articuli primi vix longiore quam articulus proximus, ramis æquis, articulo precedente plus duplo longioribus. Segmentum abdominis postremum lamellis caudalibus longius, prope extremitatem utrinque subito angustatum, spinulis apicalibus æquis minutis, aliis tribus longioribus pone apicem remotis.*

Carapax short rostrate, transverse behind, and angles rounded, beak a little longer than the eyes. Eyes quite small. Inner antennæ a little shorter than the carapax, base long, process of first joint a little longer than next joint, branches equal, much longer than preceding joint. Last abdominal segment longer than caudal lamellæ, narrowed abruptly near the extremity, apical spinules equal, minute, three longer remote from apex.

Plate 45, fig. 6 *a*, animal, enlarged; *b*, caudal extremity; *c*, inner

antennæ; *d*, outer antennæ; *e*, second pair of thoracic legs observed; *f*, third pair; *g*, fourth pair; *h*, fifth pair.

Atlantic, latitude 4° north, longitude 20° west. Collected, October 26, 1838, only one individual.

Length, one-seventh of an inch. Colourless; a little reddish near extremity of last abdominal segment. Body slender, narrow. Last abdominal segment rather longer than sixth, linear, narrowed for a short distance from the apex; the longer spinules, instead of being situated at angles of apex, are at the angle where the narrowing takes place, about as far from the apex as the breadth of the segment.

The branches of the inner antennæ appeared to consist of two equal joints; whole length of these antennæ about three-fourths as great as that of the carapax. Only six legs were seen, and these were not mature. For forms, see figures *e*, *f*, *g*, *h*, and the drawing of the animal, fig. *a*. The abdominal appendages were all mature, being perfect natatories, with short setæ.

#### FURCILIA GRACILIS.

*F. microphthalmæ affinis.* *Antennæ internæ carapace valde breviores, processu articuli primi longiore quam articulus proximus. Segmentum abdominis posticum truncatum, et ad angulos etiam paululo truncatum, spinulis apicalibus minutis æquis et ad angulos utrinque unâ longiore, quoque remotiusculis aliis duabus.*

Near *F. microphthalma*. Inner antennæ much shorter than carapax; process of first joint longer than next joint. Last abdominal segment truncate, and angles also slightly truncate; minute spinules at apex, and at angles either side a longer spinule, also, a little distant, two others.

Plate 45, fig. 7 *a*, animal, enlarged; *b*, caudal extremity; *c*, inner antennæ; *d*, outer antennæ; *e*, *f*, *g*, *h*, thoracic legs, in succession.

Atlantic, latitude 0° 30' north, longitude 17° 30' west. Collected, November 1, 1838, at 5 A. M.



Length one-eighth of an inch. Colourless. All legs in individual examined imperfect. Abdominal appendages without setæ (hence immature), excepting first pair. Caudal lamellæ about half as long as caudal segment, and probably not fully developed. First joint of inner antennæ as long as other two of base, straight and stout; the process at lower apex spinulose or serrulate within, branches little longer than preceding joint.

The last abdominal segment readily distinguishes this species from the *microphthalma*, the difference being of a kind not obliterated, in all probability, by growth.

Plate 45, fig. 8 *a, b*, represents specimens collected rather abundantly in the Pacific, about three hundred miles southwest of Valparaiso. The last abdominal segment has the same characters, except that it is a little broader posteriorly. The eyes are rather larger than in the above, and the carapax forms a low point between them. The branches of the inner antennæ are not longer than preceding joint. The carapax covers all the thoracic legs, and is broader than in the *gracilis*.

GENUS CALYPTOPIS, Dana.

*Carapax non rostratus, oculos tegens. Antennæ internæ furcatæ, articulo primo apice inferiore longè producto. Segmentum abdominis posticum truncatum apice pectinatum et lateraliter spinulam gerens.*

Carapax not rostrate, covering the eyes. Inner antennæ furcate, first joint with the lower apex prolonged acute. Last abdominal segment truncate and pectinate at apex, and laterally bearing a spinule.

The specimen examined is an immature individual, and may be Macroural or Mysidean. The thoracic legs were but partly developed, and the abdominal were wholly absent. The first antennæ and the last abdominal segment resemble these parts in the *Furciliæ*; except that this segment has a spine on the side near its middle.

The absence of a palpus from the mandible appears to show that the species cannot be young of any of the Palæmonidæ, as for example, the genera *Alpheus* or *Cryphiops*. The caudal segment has the same general form as in the *Furciliæ*, and is without the moveable setæ, which give a barb-like character to this segment in the *Euphausiæ*.

CALYPTOPIS INTEGRIFRONS.

*Carapax anticè integer, transversus, oculos omnino tegens, posticè dorso productus et acutus. Antennæ internæ bifidæ, processu articuli primi duplo longiore quam articulus proximus. Segmentum abdominis postremum truncatum, angulis obtusis, extremitate spinulis pectinato, spinulis tribus angulorum posteriorum longioribus, latere ad medium spinulam gerente.*

Carapax in front entire, transverse, wholly covering the eyes, behind dorsally much prolonged and acute. Inner antennæ bifid, process of first joint twice longer than next joint. Last abdominal segment truncate, angles obtuse, extremity pectinate with spinules, three on the angles longer, lateral margin at middle bearing a spinule.

Plate 45, fig. 9 *a*, animal, enlarged; *b*, upper view, showing eyes beneath carapax; *c*, caudal extremity; *d*, inner antennæ; *e*, outer antennæ; *f*, mandible; *g*, first pair of legs, *h*, second pair; *i*, third pair.

Pacific, north of island of Upolu, six miles from the coral reef. Collected, February 24, 1841.

Length, two lines. Colourless. The spiniform process of the first joint of the inner antennæ extends to apex of base. The two branches are one-jointed, and are much shorter than preceding joint. The outer antennæ have a one-jointed base, and two one-jointed branches; the branches are more than half the length of the preceding portion and terminate in a few long hairs or setæ. Only three pairs of legs were much developed, the others being rudimentary. Abdominal legs not at all developed. Mandible has a denticulate apex and a spiniform process



near inner angle of apex; it has no palpus. Caudal lamellæ not matured, hardly half as long as caudal segment, the outer longest.

#### ZOEA ECHINUS.

*Carapax brevis, valde convexus, et compressus, longè rostratus, et posticè spinâ longiore quam carapax fere horizontali armatus, latere prope medium spini-acuto. Segmentum caudale profunde et acute furcatum, brachiis divaricatis.*

Carapax short and very convex, compressed, a long beak and a spine behind nearly horizontal, longer than the carapax, side near middle with an acute process. Caudal segment acutely furcate, the prongs divaricate.

Plate 45, fig. 10 *a*, animal, enlarged; *b*, vertical view of carapax, (showing at 1, the beak; at 2, the posterior spine; at 3, 4, the lateral spines; at 5, 6, the antennæ); *c*, leg of first pair.

Atlantic, latitude 23° south, longitude 41° 5' west. Collected, November 19, 1838.

Length, one-twentieth of an inch. The carapax is very broad and high for its length. The posterior spine arises from near the posterior margin, and the lateral spines from near the middle of either lateral surface.

The eyes are very large, on short peduncles. Abdomen six-jointed, the joints oblong, apical terminating in two long, curved, divergent prongs, having three parallel hairs within, and one on outer margin. The heart was distinct in upper part of thorax, in advance of the dorsal spine. The particles in the blood were rather large and very distinct.

Two pairs of feet large and similar, the terminal portion two-jointed and nearly as long as basal, against which it is usually folded up; it terminates in a few long hairs. Beside this, there is also another branch, consisting of five joints, which is commonly projected outward.

Other legs anterior to these were not particularly examined. They

were in continual motion. The antennæ were four in number, shorter than beak; the superior short and thick, the inferior slender and acute, nearly as long as beak.

ZOEA RUBELLA (young of an *Erichthus*?)

*Rostrum longissimum, corpore fere longius, fere rectum, setulis supra, spinulis infra ornatum. Carapax pubescens, spinâ brevi latere et longâ dorso armatus. Segmentum caudale profundè bilobatum, lobis divaricatis lamellatis, subovatis, obtusis, setis posticè ciliatis et apicem spinâ acutâ.*

Beak very long, rather longer than the body, nearly straight, with short hairs above and spinules below. Carapax pubescent, armed with a short lateral spine and a long dorsal. Caudal segment deeply two-lobed, lobes divaricate, lamellar, subovate, obtuse, set with setæ behind, and a spine at each apex.

Plate 45, fig. 11 *a*, caudal extremity; *b*, outer antennæ; *c*, mandible; *d*, maxilliped; *e*, ciliate lobed plates seen just anterior to first pair of legs, and supposed to be attached to their base; *f*, first pair of feet; *g*, second feet; *h*, third pair; *i*, fourth pair; *k*, one of four posterior pairs; *l*, liver.

South Atlantic, latitude 24° 45' south, longitude 44° 20' west. Collected, January 10, 1839.

Length, one-sixth of an inch. Colour, in part reddish. The dorsal spine, probably a large one, was broken off near the body in the specimen seen. The carapax had a ridge of short hairs along the back, and also along the abdomen. Abdomen seven-jointed, one under the carapax. Abdominal appendages below short, naked, one of the lamellæ minute. Last abdominal segment triangular, with a deep triangular excavation separating the two lobes. Outer margin serrulate, a rather stout spine at apex, and slender setæ within. Caudal appendages nearly as long as segment; consist of a short basal joint and an oblong oval plate, which is furnished with long ciliæ. Eyes



very large, situated a little obliquely, on rather short peduncles. Colour of pigment, black, with bright blue reflections from the surface.

First pair of antennæ very short; consists of three joints, of which the first is the largest and longest, the last the shortest; a few tufts of hairs at apex. There is also a short, slender appendage, articulated with inner apex of second joint. Second pair much longer than first pair, two-branched; one, a slender, oblong lamella, acute, furnished with long ciliæ, the other, a little shorter than the lamella, composed of seven joints, of which two are larger than the others, and may be considered a base to the following portion, a flagellum.

Mouth with a pair of stout mandibles and a pair of maxillæ. The mandibles without a palpus; a broad, coarsely dentate trenchant edge at extremity. Maxillæ four-jointed (possibly another basal), the first and second with the inner margin broadly expanded into oblong oval ciliate plates; third joint short; fourth narrow oblong, and terminating in two or three setæ.

Eight pairs of legs observed. The two anterior large, as in preceding species, and similar, the first pair a little the largest: consist of an oblong two-jointed base and two branches; one of the branches five-jointed, the other, of about the same length, multiarticulate, consisting of a basal joint and of nine smaller joints following it. Third pair of legs five-jointed; a short appendage to apex of first joint; fourth pair bifid; following four pairs not observed to be bifid, six-jointed, and usually flexed at the third articulation. All the six posterior pairs are furnished at their base with oblong, curved, conical sacs, which appeared to be branchial; on second pair, there were two or three of these branchiæ to each leg. A lobed plate near base of first pair (fig. e), which is usually in rapid motion.

#### ZOEA LONGISPINA (young of an *Erichthus*?)

*Carapax sat convexus, fere corporis longitudine, rostro horizontali quadruplo longiore quam corpus, spinis duabus posticis minus dimidio brevioribus, totis horizontalibus. Segmentum caudale latè triangulatum, posticè truncatum et setis longis pectinatum.*

Carapax convex, almost as long as body, beak horizontal, and more than four times as long as the body, two spines behind less than

half shorter, all horizontal. Caudal segment broad triangular, truncate behind and pectinate with long setæ.

Plate 45, fig. 12 *a*, animal, enlarged; *a'*, same, natural size; *b*, extremity of superior antennæ; *c*, caudal extremity.

Sooloo Sea, southwest of Mindanao. Collected, February 1, 1842.

The characters of this singular animal, as far as observed, will be gathered from the figures.





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